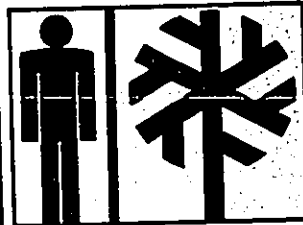


**draft
environmental statement**

**PROPOSED
MASTER PLAN**

HAWAII VOLCANOES



NATIONAL PARK ● HAWAII

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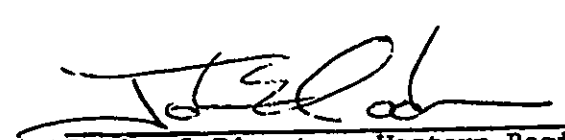
DEPARTMENT OF THE INTERIOR

DRAFT
ENVIRONMENTAL STATEMENT

DES 73 - 66

PROPOSED MASTER PLAN
HAWAII VOLCANOES NATIONAL PARK
HAWAII

Prepared by
Western Region
National Park Service
Department of the Interior


ACTING Regional Director, Western Region

OCT 26 1973

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SUMMARY

(X) Draft Statement () Final Environmental Statement
Department of the Interior, National Park Service, Western Region

1. Type of Action: (X) Administrative (X) Legislative

2. Description of Action: The National Park Service proposes a plan to conserve and protect the unique resources of Hawaii Volcanoes National Park for expanded public use and for continued volcanic research by the U.S. Geological Survey. This includes acquisition of new lands, control of exotic plant and animal species to protect native populations, and expansion of opportunities for visitor use of resources.

3. Summary of Environmental Impact and Adverse Environmental Effects: As a result of the proposed action, approximately 124,000 acres of new land will be preserved under national park status. This land, along with the existing park, will remain in an ecological state resembling, as nearly as possible, those environmental conditions that existed before Europeans introduced competing flora and fauna. Expanded public use opportunities will give the visitor a greater variety of experience from concentrated use around Kilauea Volcano to a wilderness experience in the remote backcountry areas. Also as a result of the proposal, there will be increased costs, particularly with regard to land acquisition and management of endemic Hawaiian ecosystems. Direct impact on the land will result mainly from construction of new roads and campgrounds.

4. Alternatives to the Proposed Action: A. No expansion of authorized boundaries. B. June 1970 Master Plan Proposal. C. Add Hualalai and saddle area with minimum development. D. Acquire all authorized land. E. Add sections of Kilauea Forest Reserve. F. Add land in the area of Kapapala Forest Reserve and Kapapala Ranch. G. Remove control measures for feral goats and pigs. H. No reconstruction of Chain of Craters Road. I. Expand overnight facilities. J. Remove U.S.G.S. facility from Kilauea's rim. K. Remove Kilauea Military Camp from the park. L. Provide for Hawaiian Homesites by designating a specific parcel of land for that use. M. Add various parcels of land containing unique biologic values.

5. Comments Have Been Requested from the Following:

(See listing on the following page)

6. Date Made Available to CEQ and the Public:

Draft Statement: OCT 26 1973

Advisory Council on Historic Preservation
Department of Agriculture
 Soil Conservation Service
Department of Defense
 U.S. Army
Department of the Interior
 Bureau of Indian Affairs
 Bureau of Mines
 Bureau of Land Management
 Bureau of Outdoor Recreation
 Bureau of Reclamation
 Bureau of Sport Fisheries and Wildlife
 Geological Survey
Department of Transportation
Environmental Protection Agency
State of Hawaii Clearinghouse
 State Historic Preservation Officer
Metropolitan Clearinghouse
Audubon Society
Bishop Museum
Congress of the Hawaiian People
Life of the Land
Sierra Club
Society of American Foresters
The Hawaiians
The Nature Conservancy
University of Hawaii
Wilderness Society

DESCRIPTION OF THE PROPOSAL

Hawaii Volcanoes National Park contains within its boundaries two of the most active volcanoes in the world, Mauna Loa and Kilauea. These along with the numerous historic, archeological and biological resources, some in serious danger of deterioration, require particular care in management and planning to guarantee that they will continue to be available as part of the Nation's cultural heritage for the benefit and enjoyment of its citizens.

Unique to this particular park is volcanic research, for it is equal in importance to the conservation-public use aspect common to other units in the system.

This master plan seeks to determine what the future of Hawaii Volcanoes National Park shall be: its appropriate public uses; what additional lands might be needed to further the purposes of the park; how research, both by the National Park Service and U.S. Geological Survey, shall augment the information already available; how the park's fragile biologic resources can best be protected; and what type of development is necessary to support these programs.

Visitor use at Hawaii Volcanoes has, over the years, developed a somewhat specific structured pattern. A large percentage of visitors, 400,000 of the 1,400,000 in 1972, tour the park in buses or stretch-out limosines briefly visit Kilauea Caldera and its vicinity, and then proceed on to the Kona Coast or to Hilo. The bulk of off-island visitors who rent cars generally follow the same use pattern, as do many of the local Hawaii residents. Some visitors remain in the park overnight in the volcano house or in campgrounds to enjoy the parks attractions in greater detail and to see more remote and less visited resources. The master plan proposes that this use pattern continue in generally the same manner. There are, however, some proposed changes.

It is proposed to acquire about 18,000 acres of land already authorized, add about 105,500 acres to the authorized boundary and delete about 4,900 acres from the authorized boundary, thereby containing within the park only those resources whose integrity can reasonably be maintained and ones that will relate to the volcanic-biotic complex now being managed.

Continue and augment the research program, giving special attention to exotic plant and animal control and protection of native populations.

Upgrade development and construct a limited number of new facilities, particularly on new park lands, to expand the opportunities for visitor use.

LAND ACQUISITION

Several land parcels adjacent to the present park boundary were authorized for inclusion by Secretarial Order. However, these lands can be acquired only by donation, as no funds are to be expended by the Federal Government for purchase. It is proposed to authorize, through legislation, the purchase of or deletion of the following lands.

Olaa Forest Tract (9,654.00 acres), now under the administration of the National Park Service, is a unique fern and ohia forest. It has never been an official part of the park, since the previous legislation required that all land added to the park must be adjacent to existing lands. It is proposed that legislation authorize its inclusion.

Tract 20 (1,405.83 acres) involves the intervening lands between the Olaa Forest Tract and Kilauea where there is extensive subdivision, agriculture, and golf course development. It is proposed that this parcel be deleted.

Tract 22 (5,794.88 acres) is an excellent example of extensive virgin ohia and fern forest. It is also an excellent native bird habitat and will provide an additional buffer for the Thurston Lava Tube and Chain of Craters area.

Tract 19 (3,078.76 acres), is on the eastern end of the Kalapana extension. A portion of it was acquired in 1961 to extend the road right-of-way an additional 3 miles toward Kalapana.

To protect the historic complex at Wahaula and to provide a buffer zone for the Kalapana Road, three parcels are proposed for acquisition--Parcel 12 (159.44 acres), Parcel 13 (113.17 acres), and Parcel 15 (portion) (146.16 acres). The remaining portion of this tract, 2,659.99 acres, is proposed for deletion.

Tracts 26 and 27 are southeast of Kapao Point and makai (seaward) of the Great Crack, a major geologic feature lying along the park's western boundary. Acquisition of these parcels is proposed.

There are also lands outside the current authorized boundary that are proposed for addition to the park.

Offshore lands (about 5,400 acres) are recommended for addition to protect the intertidal zone, the small island of Keaoi and the intervening coral reef between there and Halape, and to provide opportunities for interpretation of the park's associated marine life. Tidelands in Hawaii are now owned by the State.

The summit of Hualalai Volcano and the upper slopes of Mauna Loa (about 100,000 acres), are proposed additions that will include the southwest rift of Mauna Loa down to approximately the 8,000 foot elevation and to the same elevation on the north flank. Proposed addition on Hualalai goes to about the 6,000 foot elevation and also includes a corridor between that volcano and Mauna Loa. To provide an access route to Hualalai a road right-of-way (60 acres maximum) is proposed. Location is only approximate and authorizing legislation should provide for a detailed alignment study, within the following guidelines. The lower terminus will be along State Route 11, and the upper terminus inside the proposed Hualalai addition at an elevation of about 6,500 feet. The right-of-way will be purchased in fee. It will be approximately 15 miles long, a maximum of 300 feet wide, avoid significant archeological, historic and natural areas, but will necessarily be routed in the vicinity of Kahului Forest. Appropriate access points for private development will be provided, based on discussions with landowners.

RESEARCH AND RESOURCE MANAGEMENT

Resources management and attendant research at Hawaii Volcanoes is perhaps the most important part of the master plan proposal. And it is even more important in Hawaii because endemic populations are so sensitive to invasion by exotic species. Research should include the following:

- Location of ecosystem boundaries or zonal separations.

- Degree of environmental stability and guidelines for manipulating environmental factors for restoration of historic communities.

- Evaluate the historic, scientific, and scenic resources in the Kalapana Extension to determine their relative value with regard to the Secretarial authorization to grant homesites to native Hawaiians.

- Evaluation of the use of herbicides in the plant control program.

- Further pathological study of declining plant populations of the Mauna Loa strip.

- Present impact of the goat and pig populations on plant and animal communities, and the comparative impact when control programs drastically reduce or remove these animals.

- Ecological investigation of the Mauna Loa silversword, its past and present distribution, and method of restoration.

- Oceanographic investigation, including vanishing species, and possibilities for restoration and interpretation.

A complete study of bird populations, including the effect of the numerous exotic birds on the native bird populations, and the effect of exotic mongoose on ground nesting birds.

Investigation of the nene and its habitat in cooperation with the State of Hawaii Fish and Game program.

Further historical and archeological investigation of coastal villages.

Study of the legend of Pele and religious ceremonies connected with Kilauea.

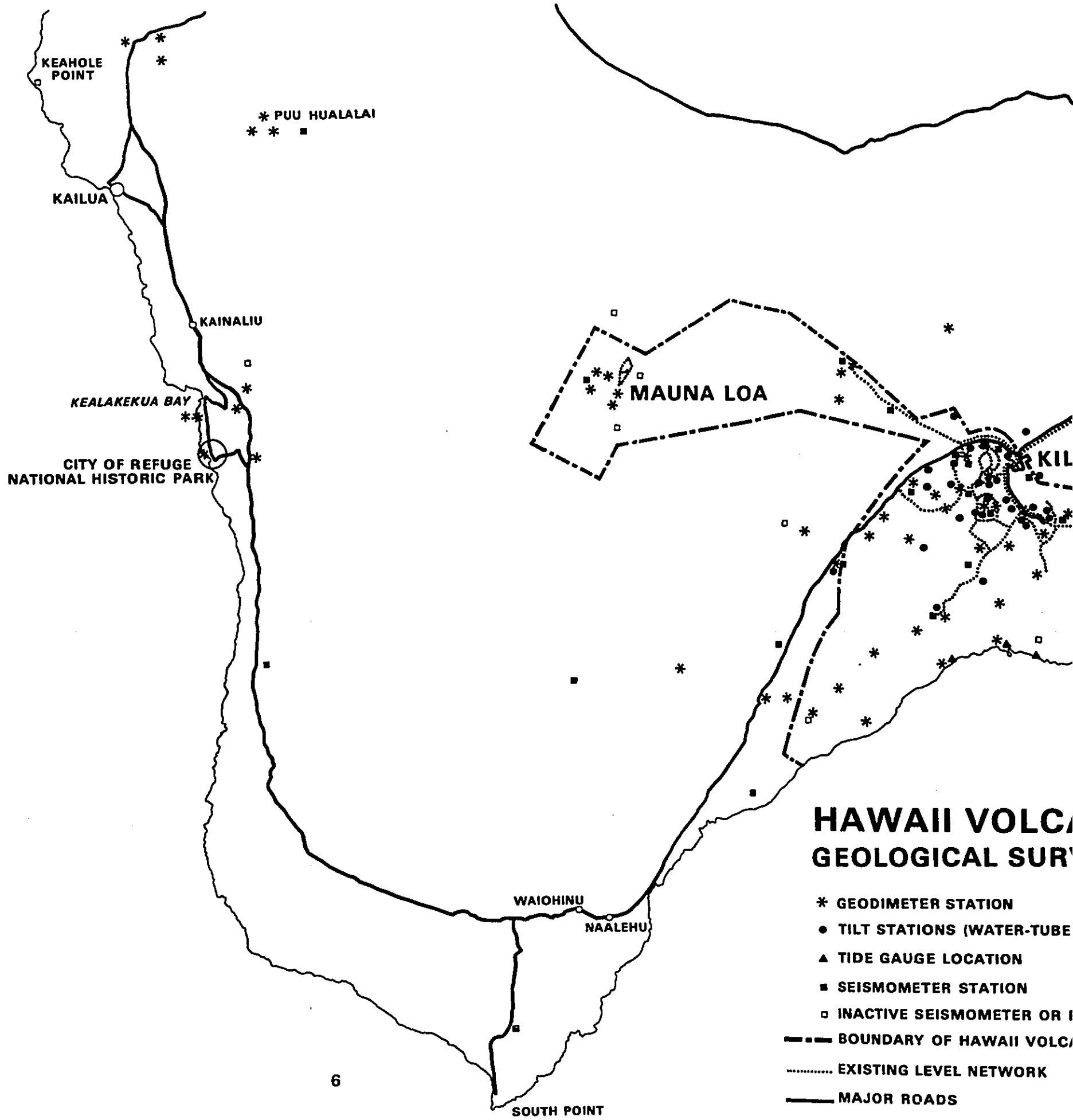
Examine the capacity of the park's resources to accommodate visitor use with no appreciable damage.

Volcanic research by the U.S. Geological Survey is equal in importance to the environmental research projects mentioned above, and predates establishment of the park. Facilities are located throughout the Island of Hawaii and shown on the accompanying map. These facilities consist of either small installations below ground disturbing less than 10 square feet of area or antennae-like structures 5 to 10 feet high above ground. No major change in the program is contemplated, although new electronic developments may allow removal of many of the aboveground wires.

As a logical follow-up to research, particularly that conducted by the National Park Service, is a dynamic program of management aimed at restoration of the park's Hawaiian ecosystems. The key to this is control of feral and exotic plants and animals. For example, it would be useless to reintroduce endemic plant species into former range--if they will be eaten immediately. And efforts to restore endangered bird populations are futile without restoration of the plant habitat that supports them.

Complete elimination of the goat from the park using known methods appears impractical and costly, if not impossible. Even if accomplished, goats from adjacent lands would likely reinfect park lands. Thus, this must be a continuing control program for the foreseeable future, as long as goat populations exist on the Big Island. Moreover, it is a program that is indispensable if endemic populations are to be restored and continued.

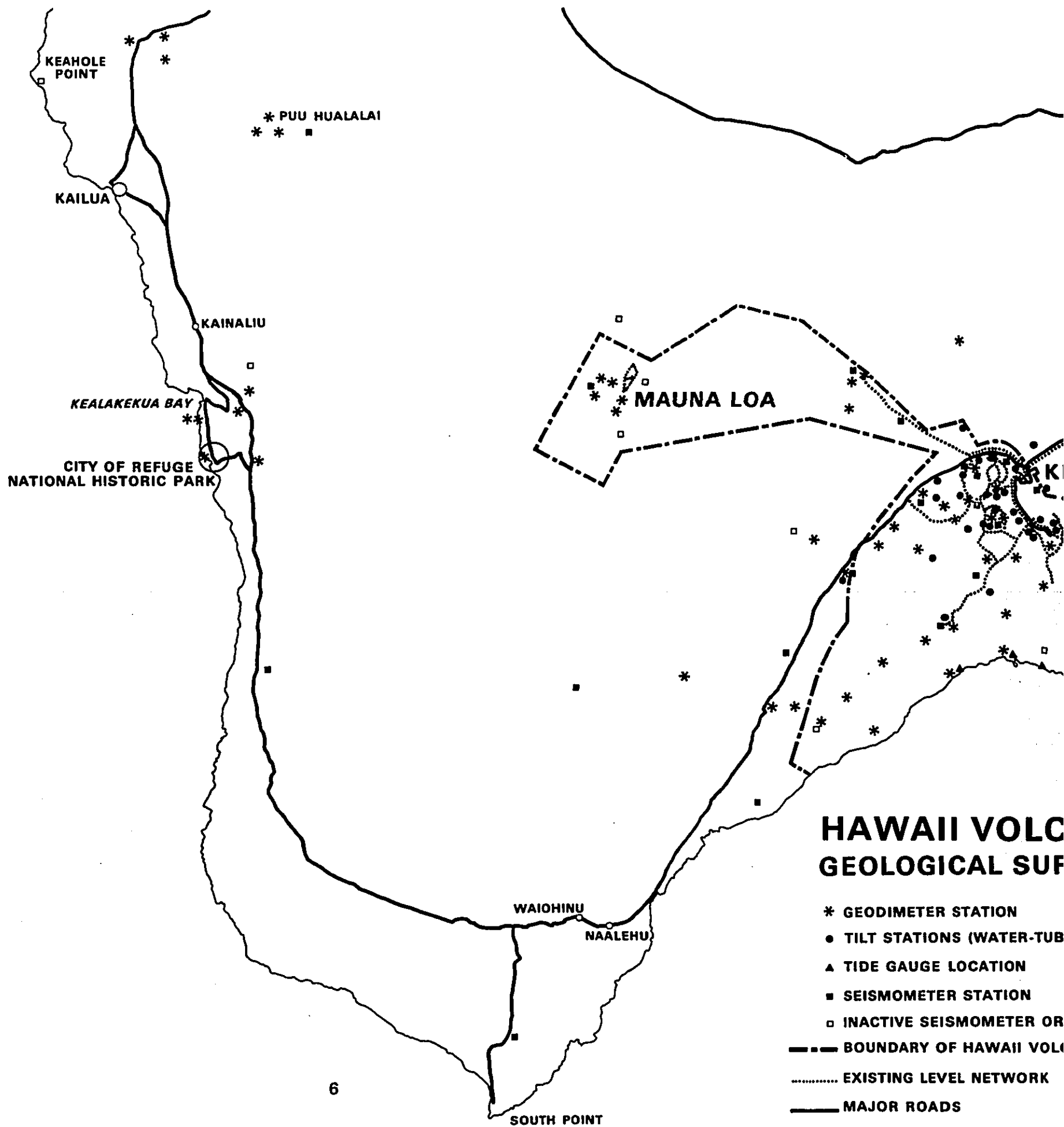
Control programs started about 10 years ago have substantially reduced the goat populations using a combination of fences, drives, and local citizen participation. There is no accurate estimate of the current goat population in the park but an average of about 4,000 goats per year have been removed. The relative success is illustrated by the fact that certain endemic plant species such as pili grass and wild portulaca have begun to re-establish themselves in areas of low goat concentration. It is proposed to continue these control measures and

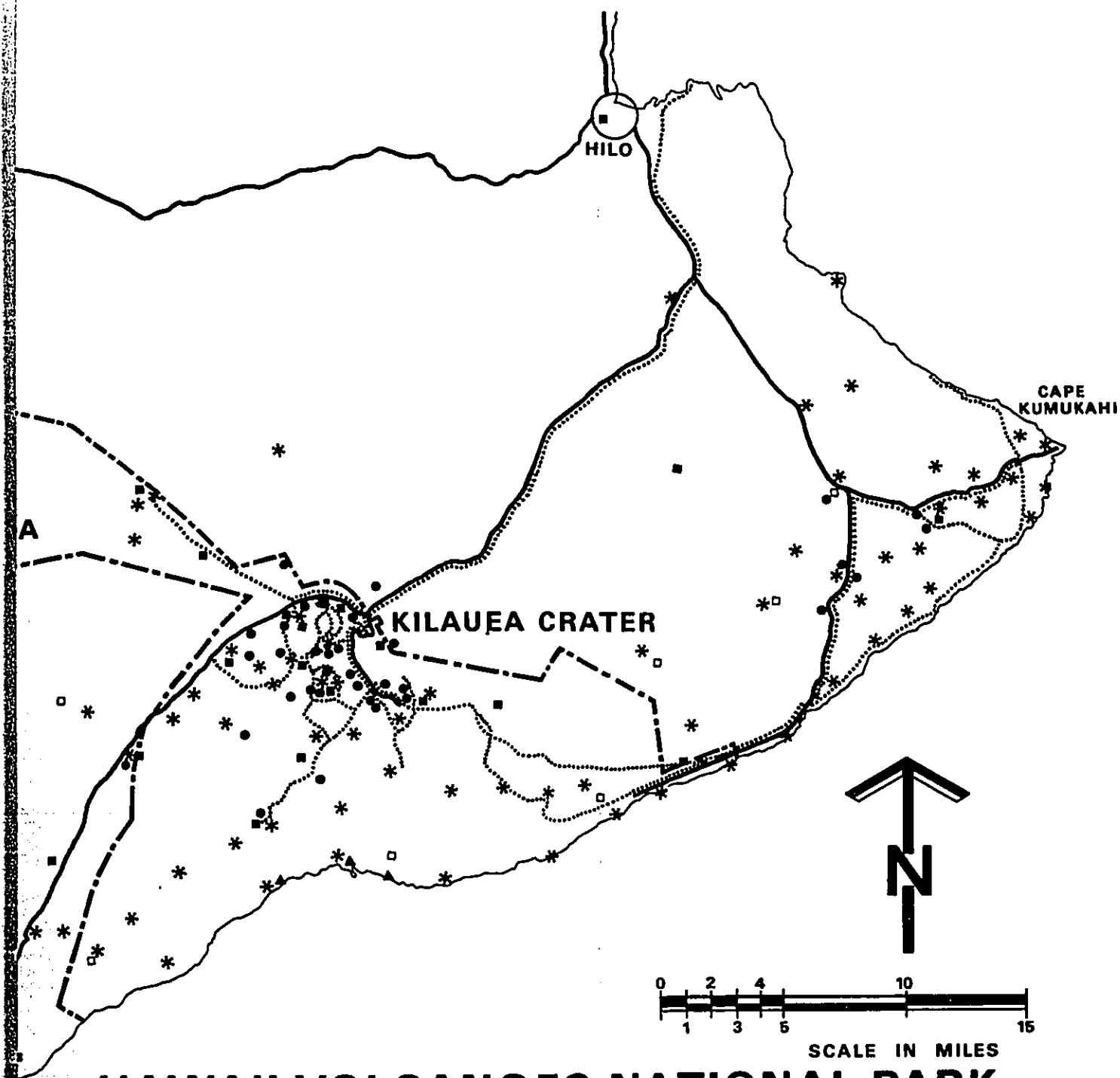


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HAWAII VOLCANOES NATIONAL PARK GEOLOGICAL SURVEY RESEARCH INSTALLATIONS

- * GEODIMETER STATION
- TILT STATIONS (WATER-TUBE AND SPIRIT-LEVEL)
- ▲ TIDE GAUGE LOCATION
- SEISMOMETER STATION
- INACTIVE SEISMOMETER OR FUTURE SEISMOMETER STATION
- BOUNDARY OF HAWAII VOLCANOES NATIONAL PARK
- EXISTING LEVEL NETWORK
- MAJOR ROADS

to construct drift fences generally as shown on the accompanying map. Eventually, all park land below 9,000 feet totaling about 40,000 acres would be protected by fencing.

Reduction of the feral pig population will be set by a detailed action plan based on research. Current known methods include direct shooting and trapping. Animals can be sold as food to public bidders. This, too, would be a continuing program and is scheduled to be expanded in 1974, if funds are available.

Research is needed to provide effective measures to actually reduce mongoose populations. For the foreseeable future, programs will be limited to developed areas, backcountry cabins and campsites, and nene goose nesting areas. Control measures for nene nesting areas were begun in 1972.

Control of exotic plant species has in the past concentrated on a few plants such as the blackberry and then only in specific areas such as roadsides and in developed areas.

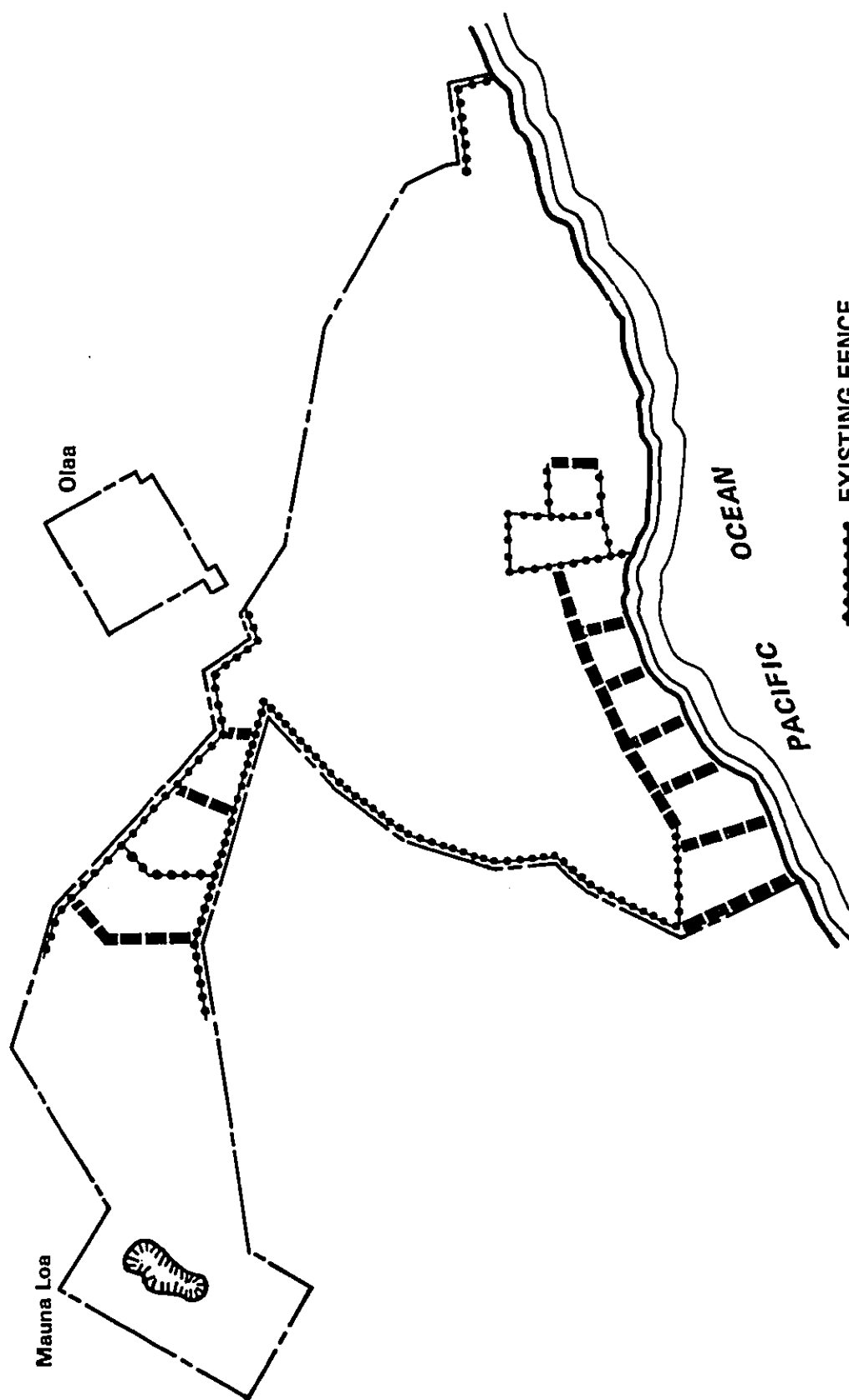
For the foreseeable future, control will concentrate on lowland forests, Kipuka Puau, the setting for Wahaula Heiau, and areas of heavy visitor use around Kilauea Caldera. Eventually, research may identify other areas as well as develop improved control methods so that this program may be expanded.

Reduction of feral goat and pig populations will do much to encourage the return of native plant species. Other methods include establishment of a nursery for growing such plants and replanting them in their original range. This is already being done in the Bird Park area.

One particular ecosystem, Olaa Fern Forest, merits special attention. The bulk of this land parcel (about 9,000 acres) is proposed as a research natural area. There will be no permanent trails and the predominant purpose of the area will be for scientific research, allowed only by permission of the park superintendent. Public use will be provided for in the small parcel on the Kilauea side of the road paralleling the forest.

VISITOR FACILITIES

For the existing park lands, the current structured visitor-use pattern is expected to continue. This involves arriving by car or bus in the Kilauea vicinity, a short visit to the interpretive center, a tour of Kilauea Caldera and any active eruption site easily accessible, and finally an exit to the coastal resort areas. There is, nonetheless, an increasing number of visitors who use rental cars, plus the continuing visitation by Big Island residents in their own cars. The latter groups are more adventurous persons who spend more time in the park and engage in a



GOAT FENCES

greater variety of activities. And they require more development and services as they probe into more remote resources little used or never visited by the tour groups.

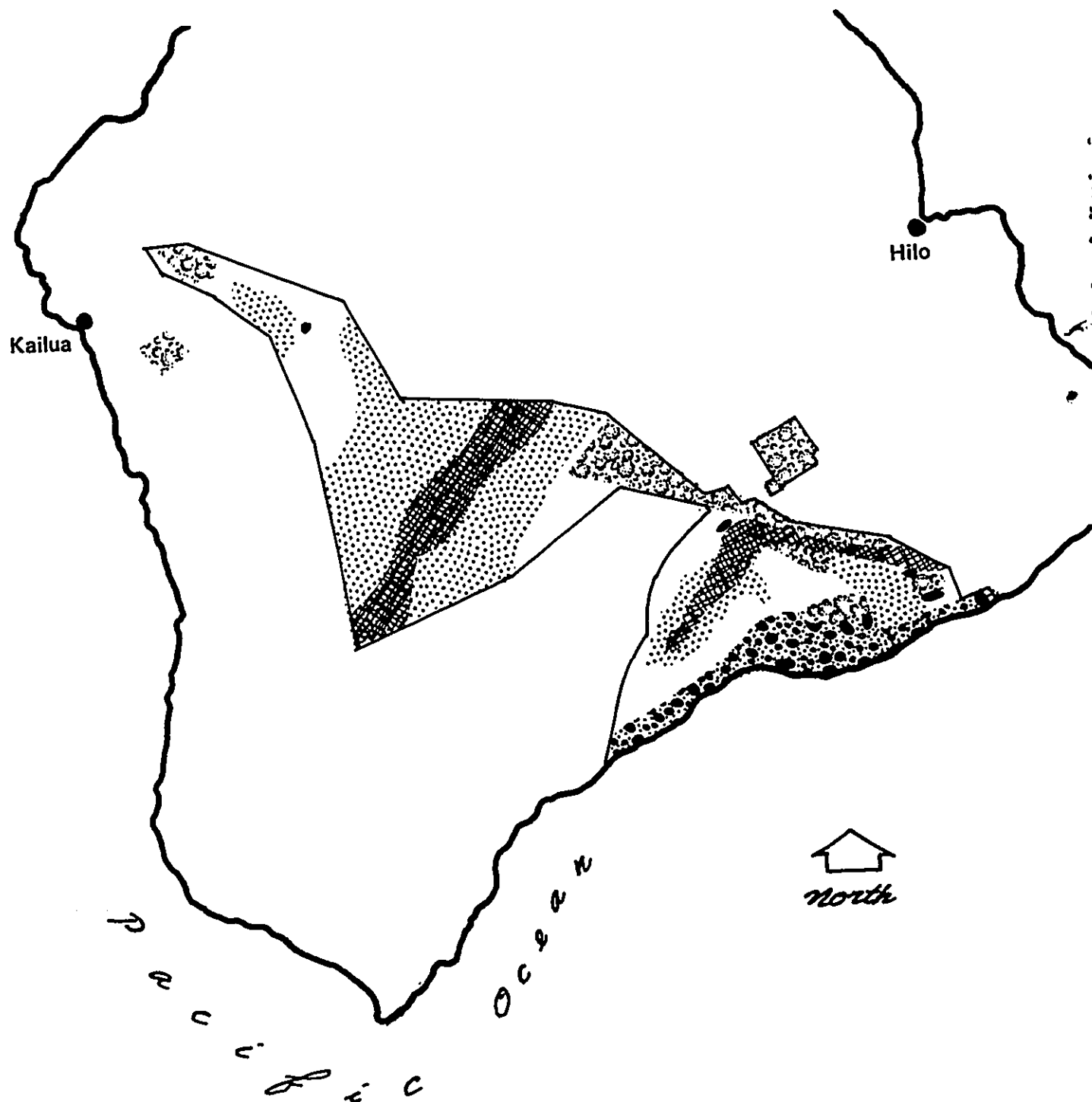
The resource classification map is an important part of the master plan proposal in that it gives an indication of those lands that are most suitable for concentrated visitor use and development. Moreover, it shows what lands should not be developed due to significant unique resources or other special physical or climatic conditions. Moreover, it gives an indication as to what lands should not be utilized for concentrated visitor use. Those lands shown as barren and high elevation are frequently cold. This together with the accompanying rare atmosphere makes them unsuitable for other than backcountry use since most visitors travel in Hawaii clad in very light clothing. Further, any development on these lands would be apparent from many points in the park and outside due to the lack of forest cover.

The significant plant communities vary in their response to public use and development. The rain forest types such as Oiaa Forest have retained much of their integrity and particular care must be taken to maintain it. The currently developed areas around Kilauea, koa forests on the Mauna Loa Strip, and the more isolated communities nearer the coast can sustain a varying amount of development and use so long as there is a continuing recognition of the importance of individual species and the integrity of their immediate environment.

Those areas where volcanic activity is most likely to take place, are the calderas and rift zones. Development of interpretive devices will continue to be important in the vicinity of these features since they are the focus of visitor interest. Investment in major facilities such as overnight lodges, campgrounds, or administrative offices will, however, be avoided. It must be recognized that almost the entire park is under a potential threat of being covered by lava flows. Major facilities must simply be located in areas where judgment and historic precedent indicate that there is the least chance of inundation by lava.

Historic and archeological resources are scattered throughout the park at lower elevations. As in the case of significant plant communities, development and use programs must consider specific sites and their relative importance in determining location of facilities.

It is reasonably clear that past development patterns have generally been appropriate to restrictions noted above. Only sections of the Chain of Craters-Kalapana Road should be relocated because of recent volcanic activity. Thus, except for proposed development and use of new park lands in the Hualalai area, little change in the overall use of park resources is anticipated as a result of the proposals outlined here.



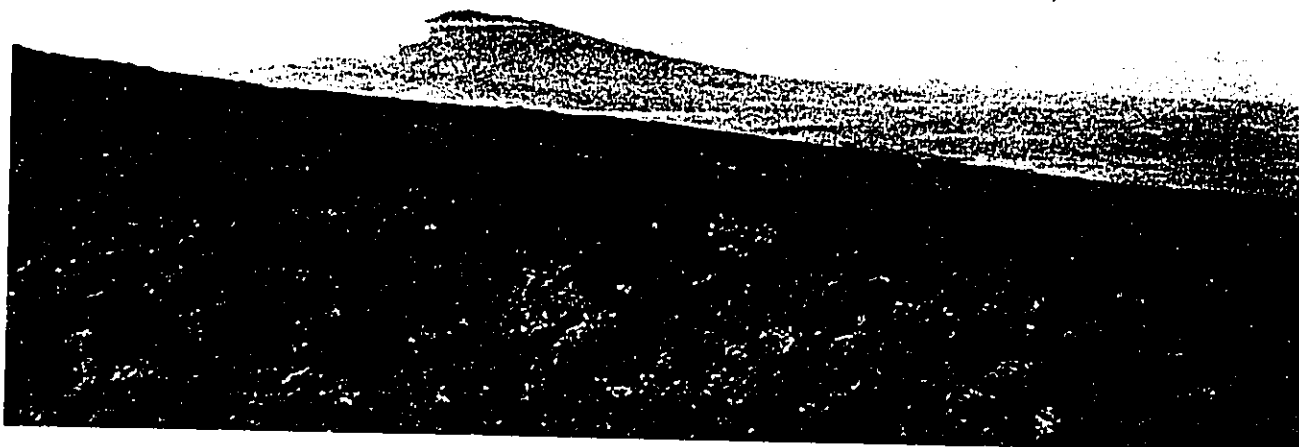
RESOURCE CLASSIFICATION

- BARREN AND HIGH ELEVATION LAND
- ~~~~~ SIGNIFICANT FRAGILE PLANT COMMUNITIES
- XXXXX AREAS OF PROBABLE VOLCANIC ACTIVITY
- AREAS OF SIGNIFICANT HISTORIC VALUE



Typical concentrated visitor use area on the rim of Kilauea Caldera but where there is little chance of volcanic activity.

Typical Barren High Elevation Lava Flows on Mauna Loa not suitable for visitor facilities. Hualalai Volcano is in the background.

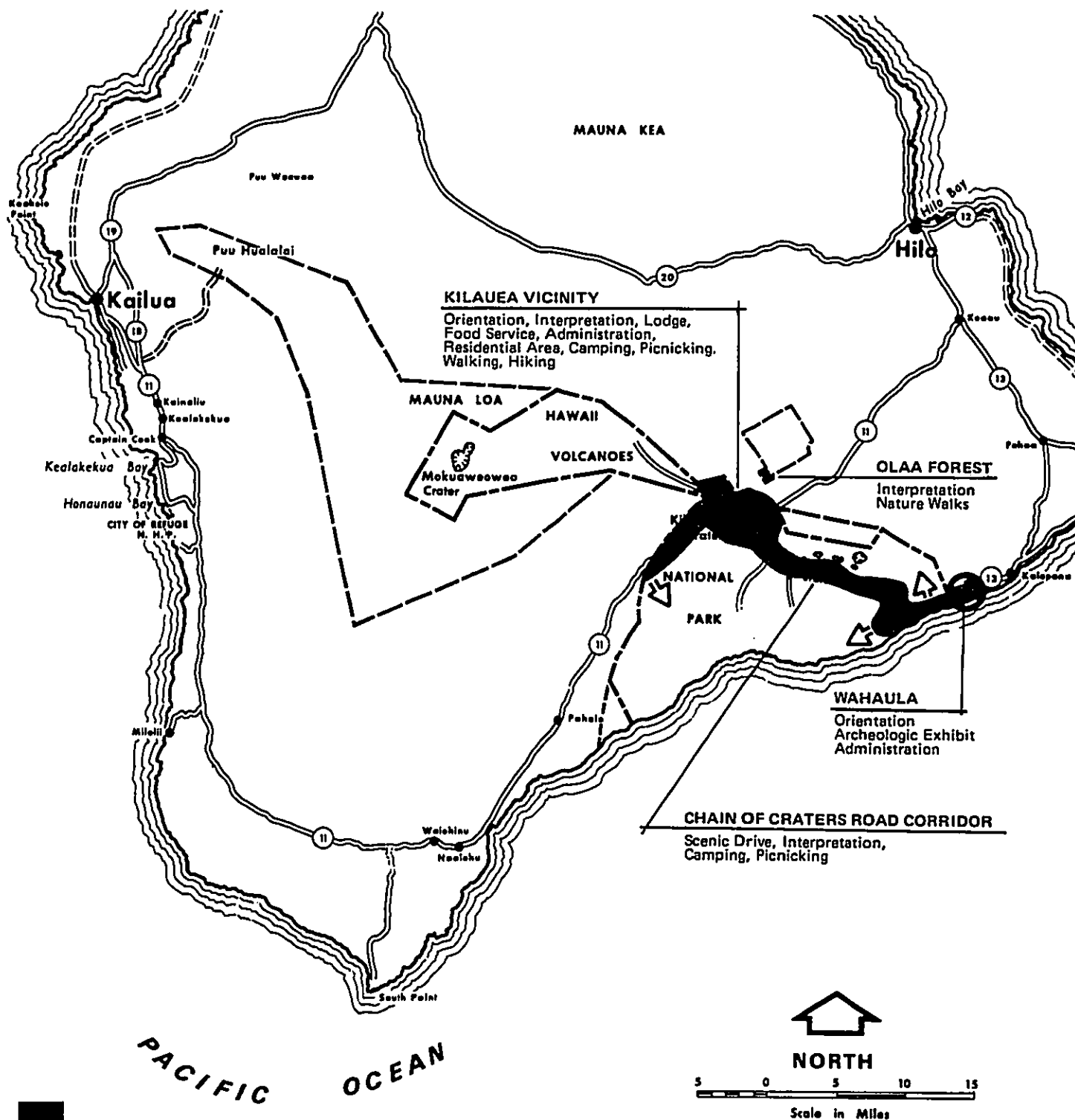


To accommodate the increasing latitude in visitor desires, the master plan proposes three use zones, each with a different level of development appropriate to the proposed uses and resulting facility requirements.

The Interpretation Zone encompasses those attractions that have been the most popular with visitors, namely Kilauea Volcano, the Kalapana coast, and the Chain of Craters Road corridor that joins them. These are the destinations for nearly all park visitors, particularly those in tour groups. Time is limited, and the visit is carefully and strictly structured to give the group the greatest opportunity to see the park's attractions while still adhering to a tour schedule. The main new facility to be constructed is the Chain of Craters Road, 10 miles of which is now covered by lava. The road is considered a successful interpretive route, and one that should be re-established when the current active eruption phase subsides. It will, however, follow a new alignment, since the original road is covered with up to 300 feet of new lava. Moreover, its location was such that lava flows tended to follow a path parallel to or on the road itself. The new road will be constructed so that, where possible, it is at right angles to the direction of the lava flow pattern. This will minimize the extent of road to be reconstructed when future eruptions occur.

At least 50% of the alignment will be across fresh lava flows. The remaining area is generally open Ohia forest and grassland with an occasional occurrence of more rare endemic plants.

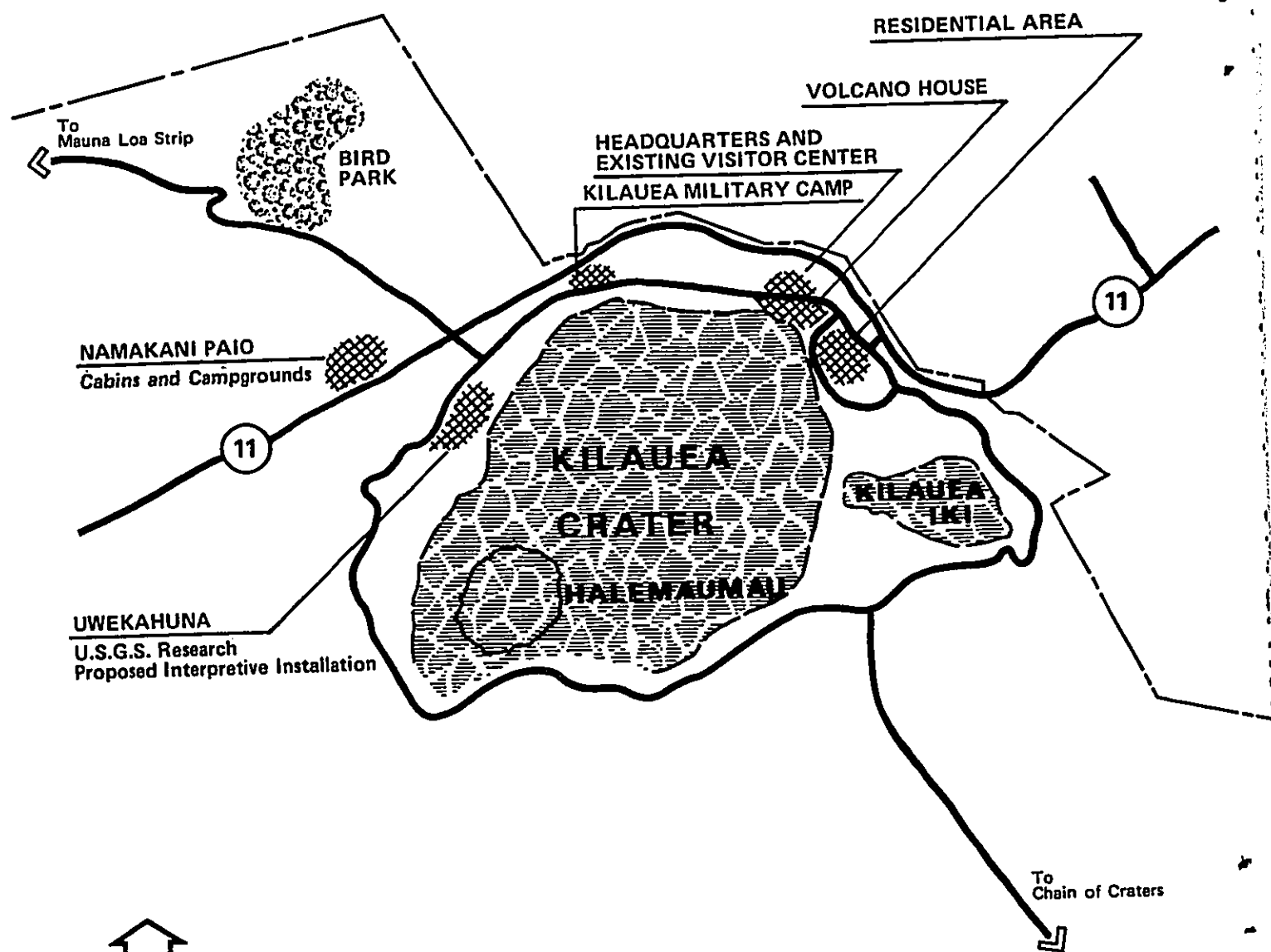
Kilauea Caldera and its associated facilities will continue to be the center of visitor and management activities, the park's most concentrated development and use area. Facilities will provide the visitor with a brief glimpse of the park's attractions, make detailed information available for those who wish to spend longer periods of time, and provide a variety of overnight accommodations. Changes in development are few. Access roads are adequate and at most would require minor realignment. As new eruption activity occurs, however, the use of shuttle buses will be considered as a method of transporting visitors from existing parking areas to the eruption site, particularly when that site is remote from any parking area or on a dead-end road. This increased flexibility will enable the park to handle large crowds and to provide greater safety for the visitor. The development concept plan, to be prepared later, will propose any specific changes. Most important is the proposal to move the visitor center function from the existing administration building complex to the Kilauea Caldera rim in the vicinity of Uwekahuna. This will involve a new parking area for 200 to 300 cars, a new building, and associated trails, walks and utilities. Approximately 5 to 10 acres will be needed for the development site. The administration-management function for both the National Park Service and U.S. Geological Survey will remain in the existing administration building. In addition the U.S. Geological Survey will continue to operate their existing research facility in the Uwekahuna area. The Volcano House and the cabins at Namakanipaio will remain at their present capacity. Use of Kilauea



PRIMARY USE ZONE HAWAII VOLCANOES NATIONAL PARK

LEGEND

- — — — — EXISTING PARK LAND
- - - - - LANDS TO BE ADDED
- ↖ BACKCOUNTRY ACCESS



NORTH



KILAUEA VICINITY

Military Camp is exclusively for active and retired members of the Armed Forces and their families. As such, it is a nonconforming use within the park boundaries, but is proposed for continuation at its current level of operation and development. Residential area for the National Park Service and U.S. Geological Survey already exists in the Kilauea area, and it is not expected that it will be appreciably expanded beyond its current capacity about 30-35 residential units.

The reconstructed Chain of Craters Road will be provided with overlooks, parking facilities, and interpretive features to give the visitor greater insight into the processes of volcanism and the evolution of Hawaiian biota. The precise extent of these developments is unknown at this time but they will be closely associated with the road itself in what can be termed an interpretive corridor.

The Kalapana Coast development will change little from its current status. The existing 10-site campground at Kamoamoa will be expanded to a maximum of 25 sites plus a picnic area. Interpretation of the intertidal and inshore waters will be part of the existing coastal road corridor development. Again the precise nature of the interpretive facility is unknown but it will be closely associated with the road.

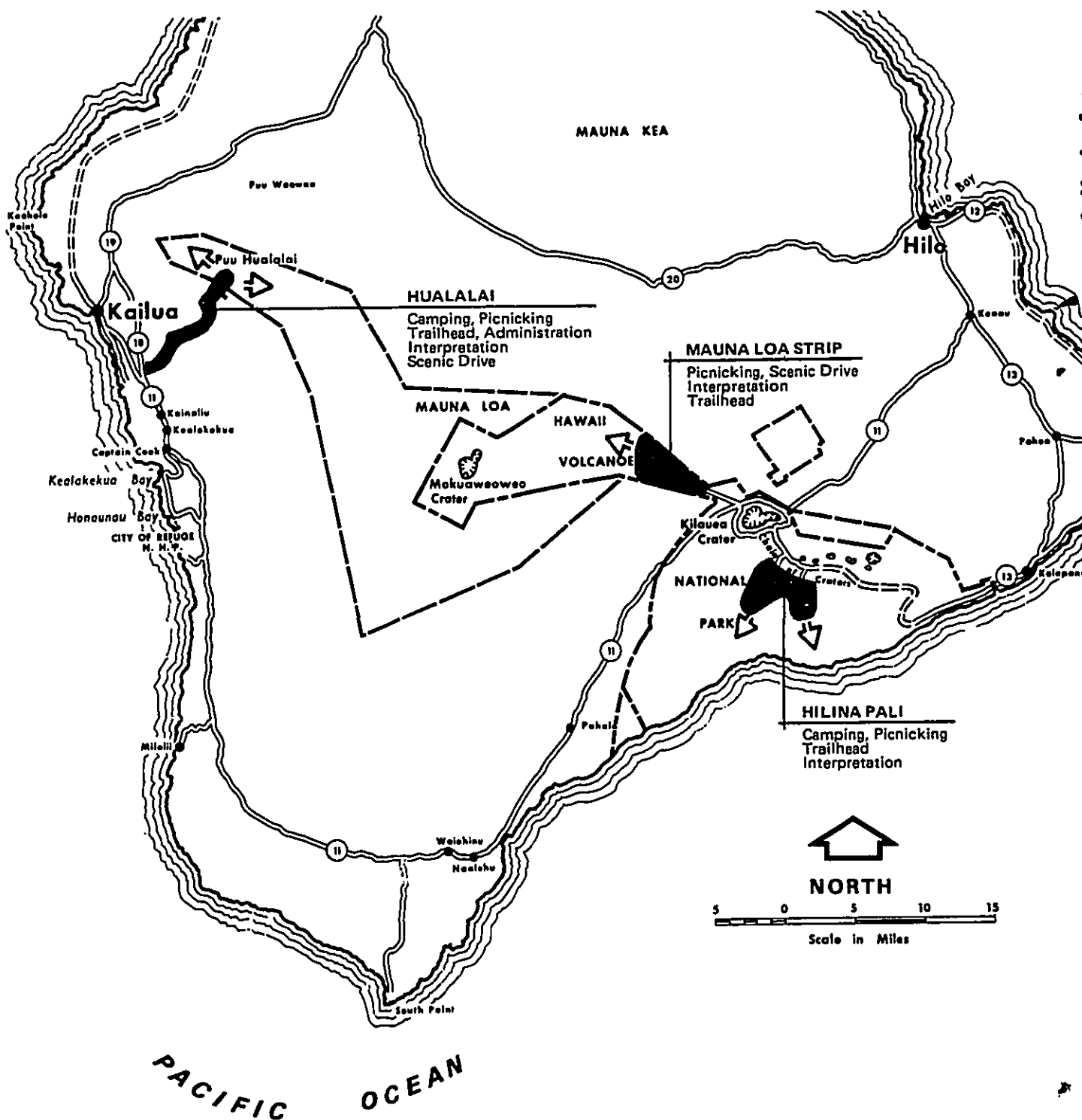
Concerning historic preservation, Wahaula Heiau will be restored as nearly as possible to its original form, based on research findings. Other historic sites such as Kailiili and Kamoamoa will be stabilized and interpreted.

The present water collection system for the Kilauea vicinity is inadequate. The addition of more rainsheds and increased storage capacity is proposed although this would entail use of additional lands. The temporary transporting of water to the Kalapana area is on an emergency basis only. It is anticipated that the completion of a county system nearby will be completed soon and a connection made to the Kalapana development.

There is an escape road east of Kilauea that is reserved for emergency use only in the event an eruption cuts the existing Crater Rim road. The terrain involved has no unique features that are not found along park roads now open for public use. It is proposed that this road remain for emergency use only.

One or more development concept plans will be prepared dealing with specific details on any changes in facilities within the Primary Use Zone. These concept plans will be accompanied by an impact statement.

The Wilderness Threshold Zone will stimulate the visitors interest in the more intimate details of the park environment. Interpretation here will be low-key and mainly self-guiding. Visitors to this zone will be comprised almost entirely of local island residents and off-island visitors who rent automobiles.



WILDERNESS THRESHOLD ZONE

HAWAII VOLCANOES NATIONAL PARK

LEGEND

- EXISTING PARK LAND
- LANDS TO BE ADDED
- BACKCOUNTRY ACCESS

Access will be on low standard roads, both proposed and existing. They will be designed not merely to provide access but also to retain an intimate association with the environment. All facilities, like the road, will be low key and for small groups of visitors. For example, campgrounds will not exceed 25 sites. They will be located predominately at the coast or at lower elevations where the climate is more suitable. Ainahou Ranch, only recently acquired, contains excellent potential for a new campground. Access to this vicinity is via the right hand road shown in the Hilina Pali section of the threshold zone. The soil depth is good, much of the area has already been disturbed and water is available. Road upgrading may be required here, but no heavy cuts and fills will be necessary and pavement width should not exceed 20 feet. No change in road alignment or standard is proposed on the Hilina Pali road or along the Mauna Loa strip.

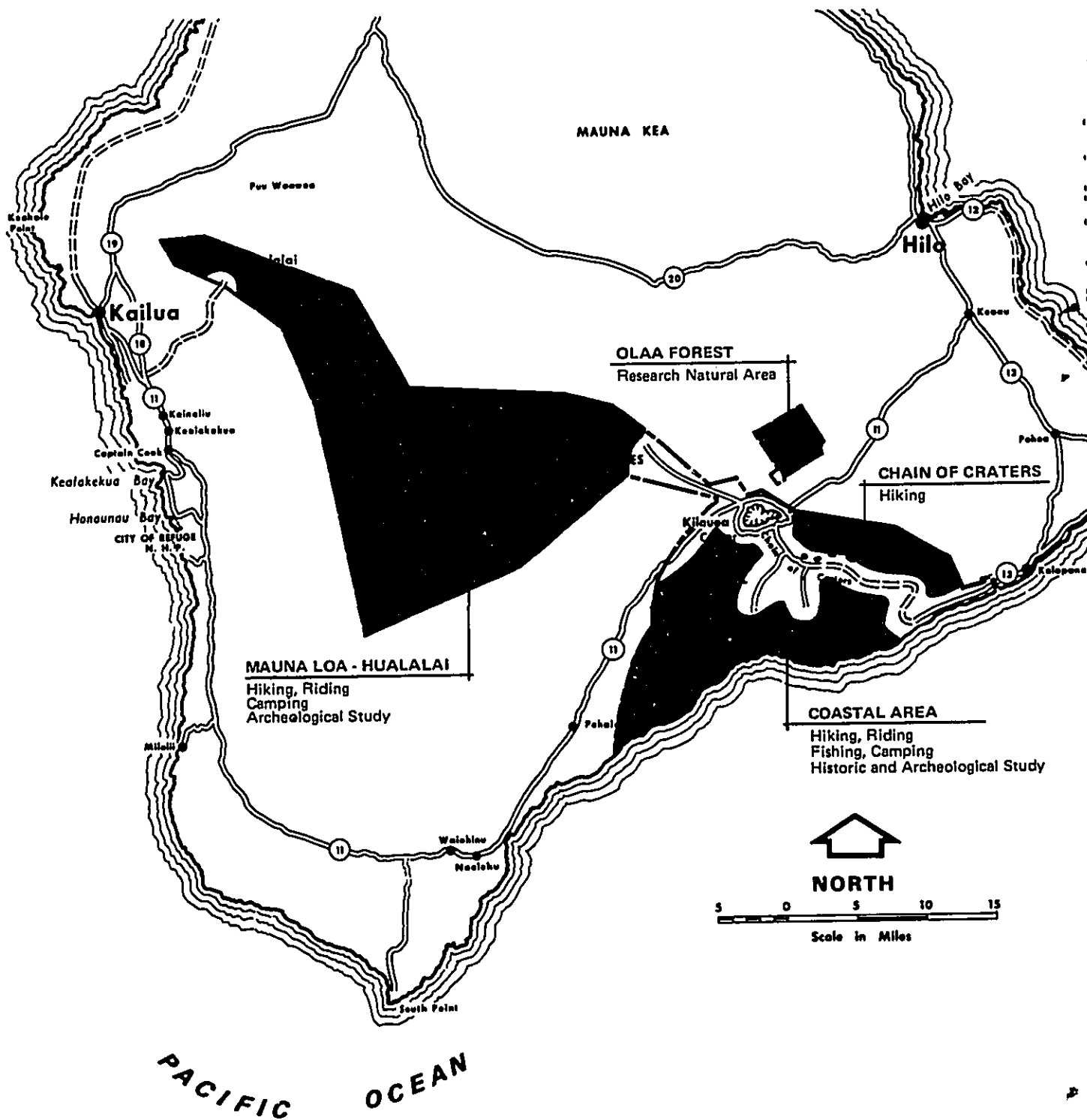
New construction will be required in the vicinity of Hualalai Volcano on land proposed for addition to the park. This includes approximately 15 miles of new road from the Kona Belt road at about the 1,000-foot elevation to approximately 6,500 feet in elevation on Hualalai. In the vicinity of the road terminus there will be a campground (maximum 25 sites), picnic area, small visitor center and a trailhead. The total development will occupy a maximum of 10-15 acres.

The new road will be minimum standard 20-foot pavement width with grades to 10%. It will pass through coffee populations near the belt road, then into the dense vegetation of Kahuluu Forest, and finally through open Koa-Ohia forest to the somewhat barren cinder fields at the base of Hualalai's summit where the road will terminate.

Development concept plans and accompanying impact statements will also be prepared for new facilities within the Wilderness Threshold Zone. These documents will discuss development and impact in greater detail. This includes precise location size and type of campgrounds, interpretive facilities, and road type, purpose and general standards.

The Backcountry Zone is the largest zone and as with other major national parks will continue to receive the lightest use with regard to visitors per acre. Again, visitors to this zone have considerable time and energy to enjoy long hikes, to see and appreciate the park's unique resources, or to fish along the coast.

In the past, the backcountry has received very limited use, partially because there is no fresh ground water available, even along the coast. As a device to encourage and facilitate backcountry use, it is proposed that minimal shelters be constructed at sites along the coast that will serve both for water collection and as camp shelters. Proposed sites include Keauhou Landing, Apua Point, and Kakiwai. There is already a shelter existing at Halape. The existing cabins on Mauna Loa (at Red Hill and on the summit) will be retained for management and visitor use. Major new trails are proposed in the Hualalai-Mauna Loa area to



BACKCOUNTRY ZONE HAWAII VOLCANOES NATIONAL PARK

LEGEND

- — — — — EXISTING PARK LAND
- — — — — LANDS TO BE ADDED
- ★ BACKCOUNTRY SHELTERS

afford access to Hualalai's summit, Ahuaumi Heiau and the Judd Trail, as well as trail connections between these areas and the summit of Mauna Loa, for a total of about 50 miles of new trail. Light rainfall on this part of the island may make the use of shelters similar to those proposed on the coast impractical. More detailed planning will be needed to investigate this problem and offer an appropriate solution.

The existing administrative jeep road to the summit of Mauna Loa, hardly more than a track, will be restricted to use by U.S. Geological Survey personnel. Vehicular use of the road by visitors is not proposed. This involves no change from the current status nor will any construction be necessary unless a lava flow from Mauna Loa should cover the existing route.

RELATED PROPOSALS

A wilderness proposal for the existing park is being prepared in conjunction with the master plan. This proposal will provide permanent non-development status for about one-half the coastal area below Kilauea Caldera, the Olaa Forest, and the summit area of Mauna Loa. An environmental impact statement will accompany the proposal.

The County of Hawaii is in the process of constructing a water system to serve the community of Kalapana. Included in the contract is an extension into the park along the Chain of Craters Road to serve the Kalapana Visitor Center.

The State of Hawaii is engaged in upgrading State Route 11, which passes through the park in the Kilauea vicinity. The specific road standards are not known at this time but any improvement within the park would have some effect on the environment.

DESCRIPTION OF THE ENVIRONMENT

THE REGION

The Island of Hawaii--sometimes called the Big Island--lies at the southeast end of a chain of islands extending nearly 2,000 miles across the north-central Pacific. These islands, 124 including islets and atolls, are the emerged peaks of a tremendous volcanic mountain range rising from the ocean floor. There are only 8 main islands, and these, located at the southeast end of the chain, form the group commonly known as the Hawaiian Islands.

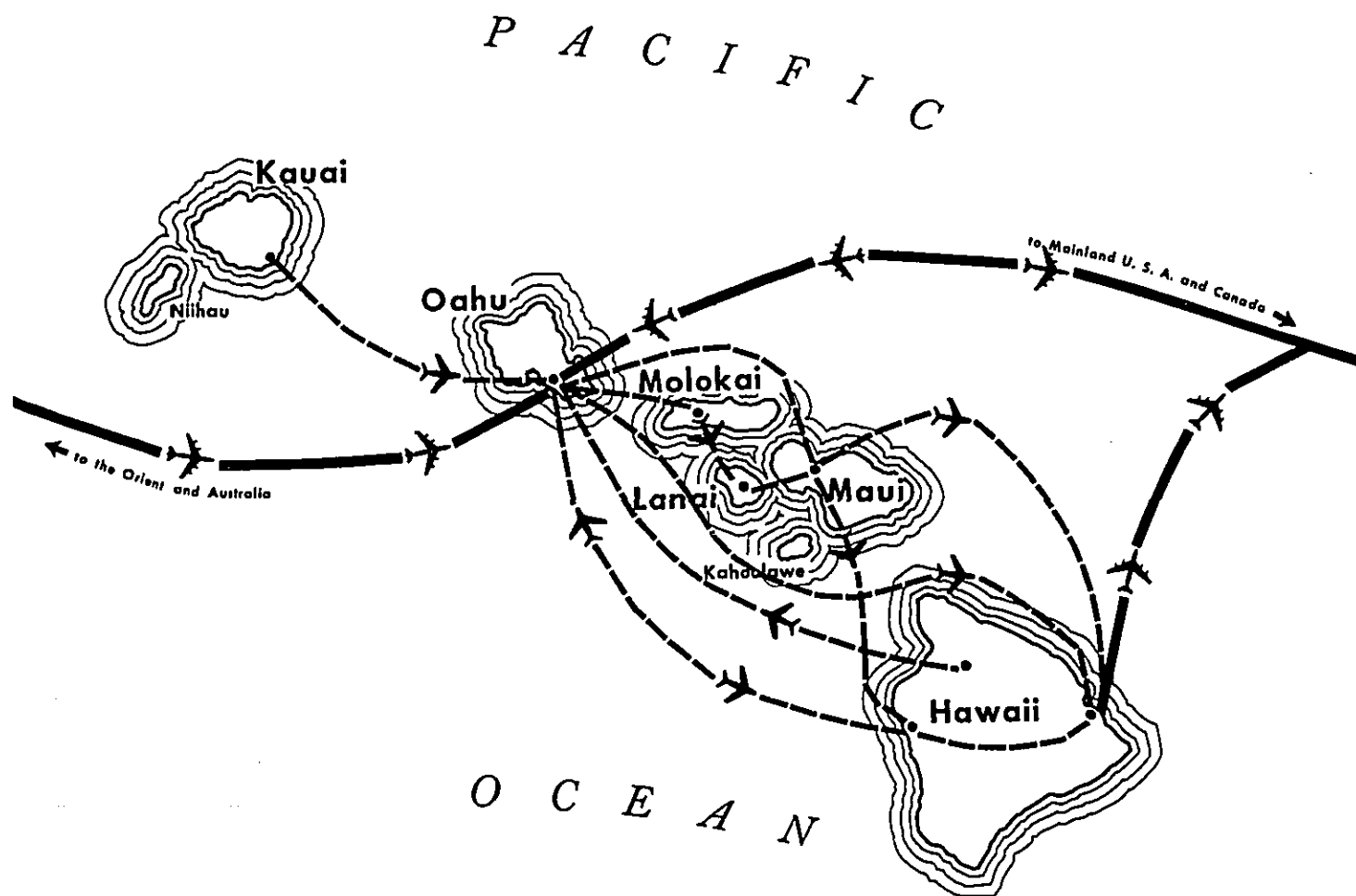
Long extolled in tourist promotional programs for their pleasant climate, romantic history, exotic peoples, unusual scenery, and recreation opportunities, the Hawaiian Islands have become a vacation dream for many "Mainlanders". As air fares decrease and personal incomes rise, visitation to the islands has increased dramatically. From less than half a million in 1960, the 1972 visitation rose to over 2.2 million in 1972. The Big Island has also shared in this increase, less than quarter of a million in 1960 to 630,000 in 1972. The primary tourist destination is the Island of Oahu which possess the State's major urban complex centered around Honolulu, Waikiki Beach, the bulk of hotel accommodations, and the only international air terminal. From Oahu, Hawaii and the other neighbor islands are only a short flight.

Access

Access to the State is almost entirely by air. Jetliners arriving from North America, Australia, New Zealand, and the Orient make Honolulu one of the world's busiest airports. Use of the Big Islands' airport at Hilo by scheduled airlines operating from West Coast cities commenced in 1967. Boat travel, previously an important means of access, has dropped to near zero as compared to the faster air travel, particularly as newer jet aircraft carrying up to 370 first- and economy-class passengers began operation a few years ago.

Inter-island airlines make about 30 scheduled flights daily to the Big Island terminals of Hilo, Waimea, and Kona. Visitors with limited time may arrive and leave the same day--from a different airport if they desire. The Big Island is included on one-day air tours originating in Honolulu which permit short stops and provide excellent aerial coverage with in-flight informational talks. An inter-island auto ferry system is planned but is not yet in operation.

Intra-island circulation is by ground and air transportation centered around Hilo, Waimea, and Kona. Cars and pickup campers may be rented. Commercial tours are available by bus and tour car. Air taxis fly visitors to other airstrips.

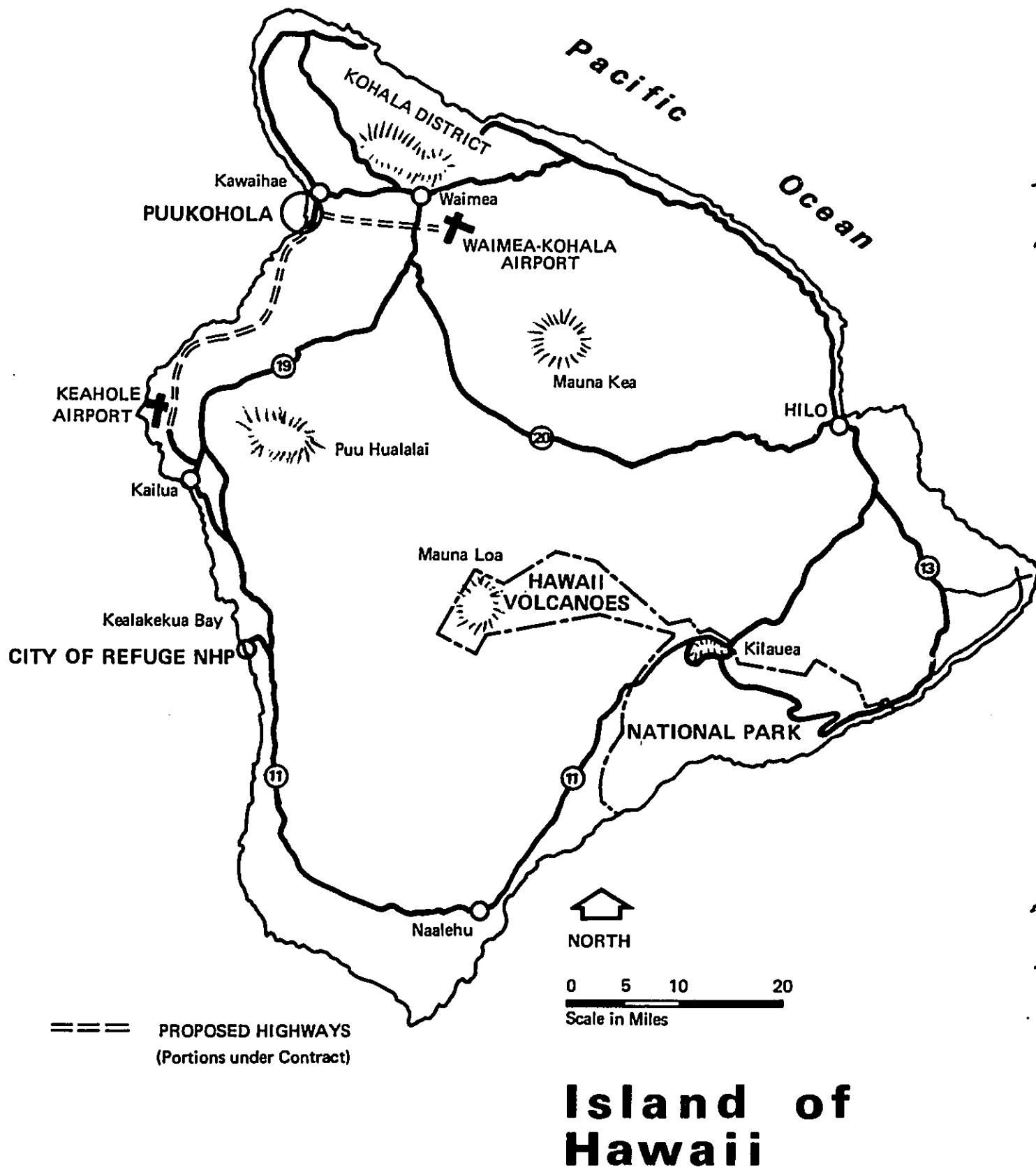


OVERSEAS AIRLINES
INTER-ISLAND AIRLINES



ACCESS





Current access to Hawaii Volcanoes National Park is generally satisfactory, except for the fact that much of the Chain of Craters Road has been covered with new lava in the past few months. Previous to this, the Golden Triangle was a popular loop trip from Hilo to Kalapana and Kilauea Volcano. The "Belt Road," consisting of State Highways 11 and 19, makes a general loop around the island and provides the main surface route between towns and communities for commercial and visitor use. It passes through Hawaii Volcanoes National Park near park headquarters and is connected to City of Refuge National Historical Park by an excellent secondary highway. The State plans to upgrade the entire belt road system to a high-speed standard.

Population

Although the State of Hawaii ranks 15th among the 50 states in population density (approximately 100 persons per square mile), the Island of Hawaii is still sparsely populated with only 15 persons per square mile. The State population has continually increased, while the Big Island population decreased for a number of years because of the mechanization of agriculture and the loss of some industry. This decline is over, however, and a period of growth has apparently started. Most of this growth will take place in the resort regions on Hawaii's dry west coastline, where a new road along the coast between Keahole airport and Kawaihae will open up additional land for homes and resorts. Most of the islands residents already live near the coast, about half being concentrated in and around Hilo.

<u>County</u>	<u>1950 Census</u>	<u>1960 Census</u>	<u>1968 Census</u>	<u>1980 Prediction</u>
Hawaii	68,350	61,332	63,468	69,486
Honolulu	353,020	500,409	630,528	930,000
Kauai	29,905	28,176	29,761	32,242
Maui	48,519	42,855	46,156	54,798
STATE TOTAL	499,794	632,172	769,913	1,086,526

Land Character and Use

Land use, both existing and potential, is closely related to the island environment, which varies widely in desirability. The generally smooth and gently sloping topography is related to the lava flows originating from the five volcanoes which created the island. Because Hawaii is a young island with many fresh lava flows, much of the land is still barren.

Climate is largely the product of the prevailing trade winds, high mountain masses, and elevation. The annual temperature averages a

balmy 75 degrees Fahrenheit at sea level, but freezing winter weather is to be expected on the snowy summits of Mauna Loa and Mauna Kea where elevations exceed 13,000 feet above sea level. The eastern side of Hawaii intercepts the moisture-laden trade winds that encourage lush humid rain forests and commercial sugarcane production, the chief industry of the island. Hawaii also has the only coffee industry in the United States, the world's largest commercial orchid-growing center, and produces papayas, macadamia nuts, and tropical flowers for local use and export. In addition, there are extensive grass and scrub areas used for grazing livestock. Even so, large areas of the island still contain undeveloped forests and barren lava fields.

Under the State's "Greenbelt" Law, all land in Hawaii is classified into four major land-use districts: urban, rural, agriculture, and conservation, as determined by the State Land-Use Commission. This law provides some assurance that land will be used for its best purpose and that development will be compatible with the uses permitted within the four categories. The counties regulate internal zoning in the urban, agricultural, and rural districts; the State Department of Land and Natural Resources regulates use in the conservation districts. Outdoor recreation and the preservation of natural resources and cultural values are considered in administering the State Land-Use Law. The law states that, "Conservation districts shall include areas necessary for protecting watershed and water resources; preserving scenic areas; providing park lands, wilderness and beach reserves; conserving endemic plants, fish, and wildlife; preventing floods and soil erosion; forestry and other related activities; and other permitted uses not detrimental to a multiple use conservation concept."

Hawaii's abundant recreational opportunities are largely undeveloped. The island's 266 miles of coastline, its varied topography, and vast areas of wild lands comprise a raw resource adaptable for swimming, surfing, fishing, boating, hiking, horseback riding, hunting, camping, and picnicking. Coastal-oriented recreation holds the greatest appeal for visitors, but island residents are interested also in other activities. Some even seek Mauna Kea's snowy summit for skiing.

Paradoxically, Hawaii has relatively few swimming beaches. Most are on the west coast between Kailua and Kawaihae where there are about six small sandy coves. Sand, however, is not essential for swimming. Rocky coves and bays offer excellent possibilities for snorkeling or scuba-diving to view tropical fish and coral.

Hawaii is also rich in the sites and events which led to the founding of the historic kingdom of Hawaii, the political ancestor of the modern State.

State and county parks have been established for a variety of historic, scenic, scientific, and recreational sites, but private enterprise is also making indispensable contributions toward the recreational use of Hawaii. Without accommodations, there could be little nonresidents use of the recreational resources. Spectacular resort hotels have been built where they provide access to beaches or scenic views of the coast. Some of the more isolated resorts are complete recreation complexes including golf courses, swimming pools, tennis courts, and equestrian trails. The number of such accommodations continues to increase. There were 2,188 hotel rooms on the Big Island in 1968. This increased to 4,701 in 1972. The major concentration is in Kailua, Kona (about 2,487 rooms) but future expansion will likely spread along the coast from a little south of Kailua to the Kawaihae/Waimea area.

There is little resort development adjacent to Hawaii Volcanoes National Park, except along the coast, and even this is not likely to reach the proportions of the Kona development. On the adjacent mauka or upland areas land type and use varies. Near the park's Mauna Loa strip there are barren lava flows at high elevations and scrub forest below. Grazing is the only current use. Grass and scrub grazing lands also lie west of the park's Kilauea section. The more humid forests are contiguous with most of the eastern boundary. Adjacent lands are primarily owned by trust estate or the State of Hawaii. Between the Kilauea section and the Olaa Forest Tract are estate lands leased for small homesites, agriculture, and a golf course. The balance of the tract is surrounded by forest and grazing lands. There is considerable subdivision activity close to the boundary in the Kalapana section.

THE PARK AND ITS RESOURCES

Kilauea and Mauna Loa volcanoes are the dominant features of the park. Surrounded by recent lava flow materials and unique endemic plant communities, these are dynamic land forms where new lava flows can drastically change the landscape. Indeed, recent eruptions in the Mauna Ulu vicinity have covered many acres with lava up to 300 feet deep, created new land where flows enter the ocean and built up a new mountain where none existed before.

Mauna Loa and Kilauea are the most studied and best understood volcanoes in the world. The favorable opportunities afforded by Hawaiian volcanoes for fundamental and detailed research are not duplicated or even approached in any other part of the world. The program of study is under the direction of U.S. Geological Survey scientists. And Kilauea is perhaps the most safe and accessible active volcano for people to see. This dual role makes the park of extreme value for both research and sightseeing.

With the arrival of European civilization to the Island of Hawaii two hundred years ago, the fragile native biota of the islands was disturbed. Some of these changes have been almost catastrophic with regard to certain









plant and animal species, but to the uninitiated visitor these changes are not readily apparent, so that to them the park appears to be much the same today as it did when the first man saw the magnificent displays of volcanism, the great fern forests, and the superb views along the seacoast and up the palis.

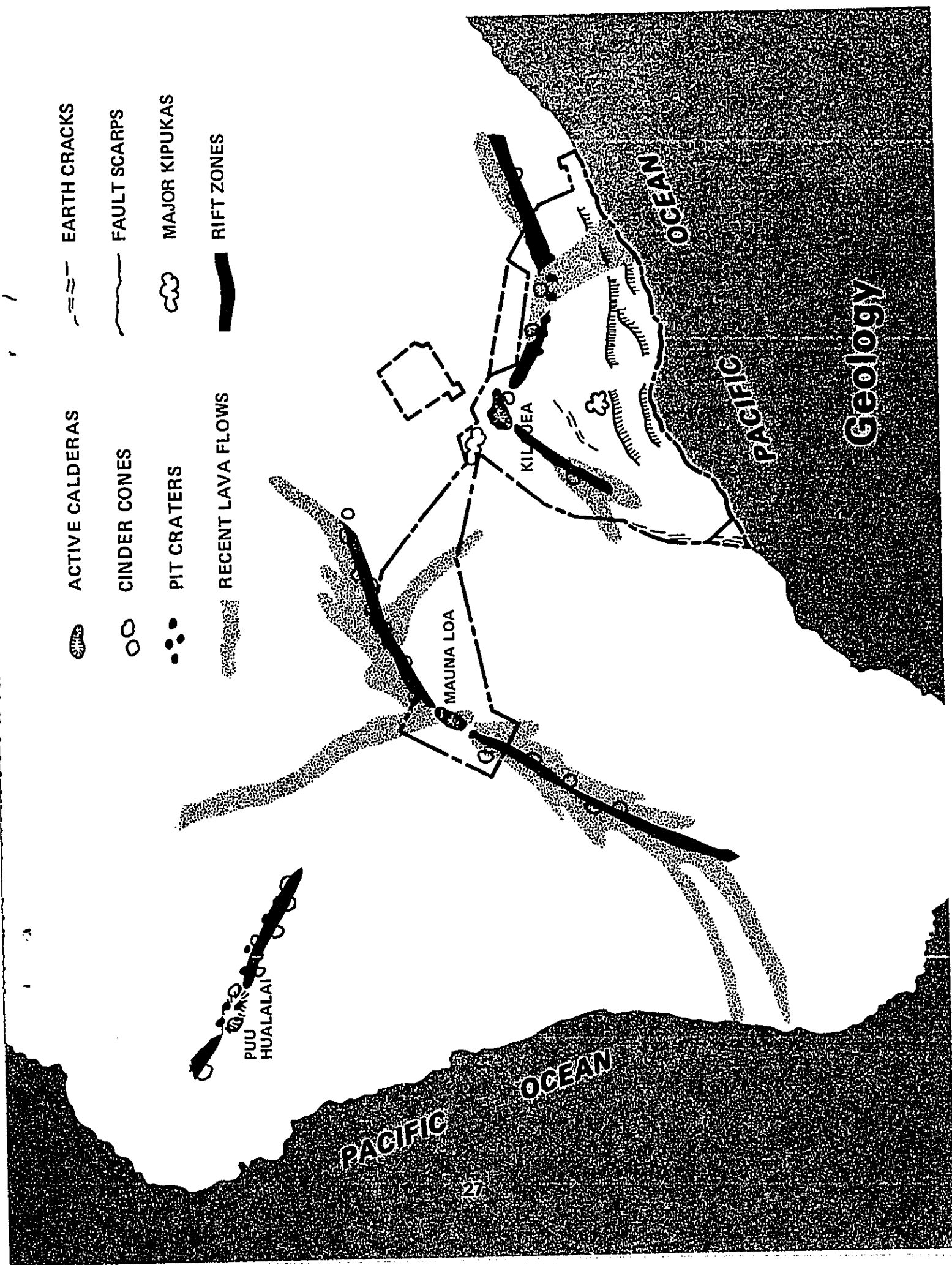
Geology

Park lands encompass the summit and part of the southeast flank of Mauna Loa Volcano and almost a third of Kilauea Volcano. These broad, flat volcanic domes rarely explode, but do send up fountains of molten rock hundreds of feet into the air. Eruptions generally occur in calderas (huge collapsed depressions in the summit) or along the rift zones on the flanks of the volcanoes. Kilauea is the most active volcano in the world, and one of the most famous due to the presence of an almost continuously active lake of liquid lava in the Halemaumau fire pit during the 19th century and the first quarter of the 20th century. Other lava lakes existed for short periods elsewhere on the caldera floor and along the Chain of Craters. In fact Mauna Ulu, a newly formed shield, has been almost continuously active for the past two years and has contained a lake of molten lava most of that time. Throughout history, however, Halemaumau has been the principal place of volcanic activity. Kilauea's two main rift zones are defined by large pit craters, cracks, and cinder cones, and its seaward side is bounded by great fault scarps contrasting with its other gentler slopes. Lava flows, devastated areas, and steam cracks show old and new activity. Steam issues from the ground at many places in and around Kilauea caldera and along the Chain of Craters.

Mauna Loa is a massive, flat-domed shield volcano built by layer upon layer of lava flows and is recognized as the best example of its type in the world. Extending from about 20,000 feet below sea level to 13,677 feet above, it is one of the world's greatest mountains. Its upper slopes, along its two principal rift zones, contain extensive, recent flows that are stark, colorful, bare, and forbidding. Since man has watched it, Mauna Loa has been intermittently active, with periods of quite ranging from a few months to more than 20 years. Many of its eruptions are confined to the caldera of Mokuaweoweo; others start there, then split open the side of the mountain and gush from cracks in the flanks far below the summit and rush many miles to the sea. Both Kilauea and Mauna Loa are young volcanoes, for their growth keeps well ahead of erosion. Geologists calculate from its present growth that Mauna Loa could have been formed within the last million years.

There are no mineral values in the park, since the island is formed entirely by volcanic action. Building stone could be taken from the park in certain areas, but it is also readily available throughout the island.

- | | | | |
|---|-------------------|---|---------------|
|  | ACTIVE CALDERAS |  | EARTH CRACKS |
|  | CINDER CONES |  | FAULT SCARPS |
|  | PIT CRATERS |  | MAJOR KIPUKAS |
|  | RECENT LAVA FLOWS |  | RIFT ZONES |



Vegetation

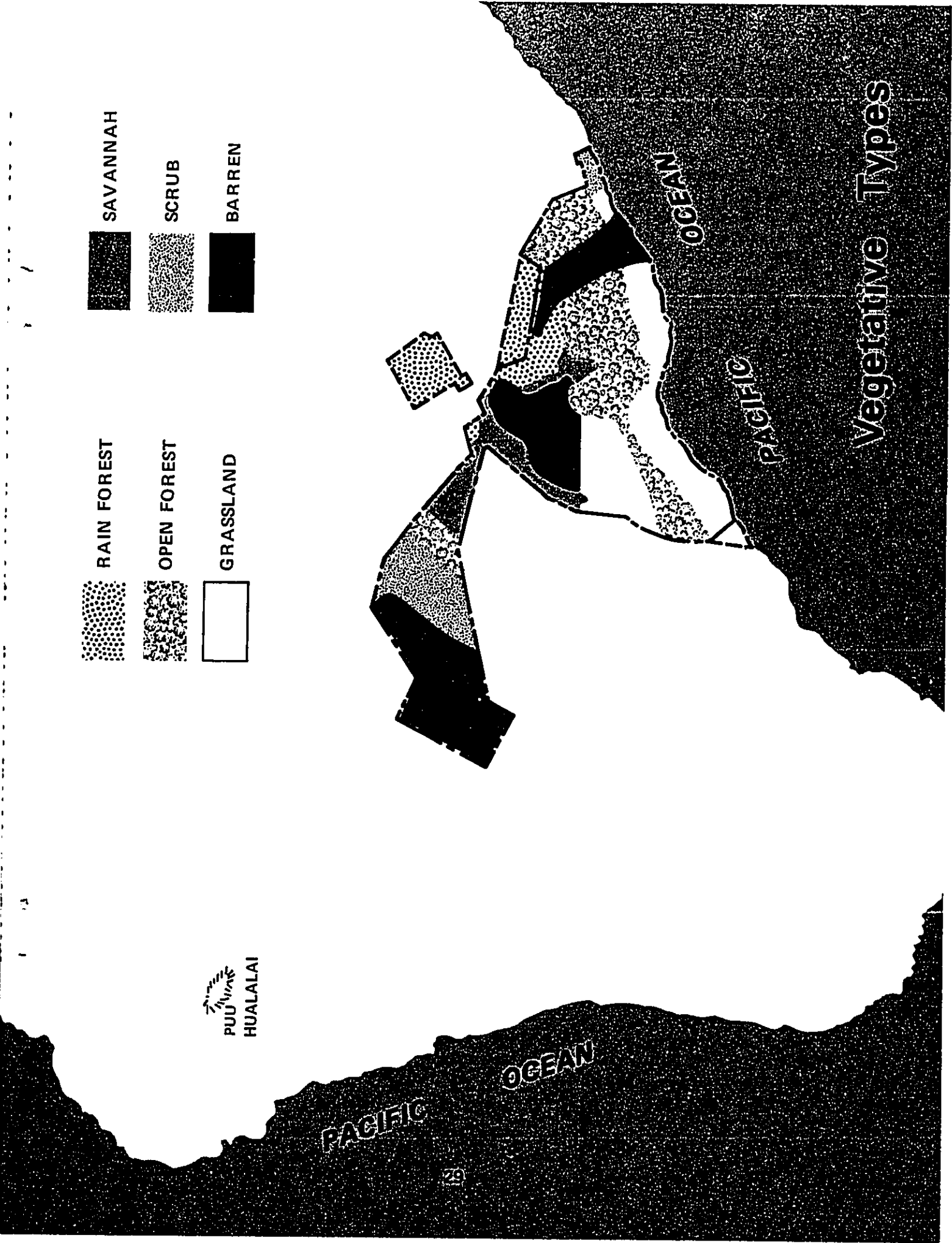
Hawaiian flora is quite young in comparison to continental systems. And it is believed that endemics evolved with little competition, particularly since most plant communities possess numerous niches that were never filled by native species. The result is that Hawaiian vegetation is especially vulnerable to structural and composition change when highly competitive species were introduced.

With an elevation range from sea level to 13,677 feet and a precipitation spread from 15 to 100 inches of rain annually, there is within the park a wide range of 23 distinct vegetative types--from lush rain forest jungle to the sparse vegetation of the Kau Desert, a few miles to the southwest. Some native species are endemic only to a single valley or mountain slope.

Dense ohia and fern "rain forests" exist in areas of heavy rainfall. In drier areas, the forest opens into savannah containing mixtures of ohia and koa trees, and in the other areas there is only low scrub and open grasslands. The Kau Desert is nearly barren, as is much of the coast.

Some rarer plants, such as varieties of hibiscus (*Hibiscadelphus*), are found in kipukas (older areas that have been surrounded by more recent lava flows). They can be readily recognized as islands of denser vegetation in sparsely vegetated areas. Kipukas represent somewhat simplified ecosystems suitable for studying integral ecological relationships. Here isolation of small populations provides opportunities for evolutionary study. The park's two best known kipukas, Kipuka Puauulu, popularly known as "Bird Park," and nearby Kipuka Ki, contain unique and complex compositions of plant species and are judged to be "of great age."

During the Polynesian colonization period, several nonnative plants were released into the native vegetation. In a relatively short period, some of these became securely established. The appearance of western man, near the close of the 18th century, marks the beginning of mass introduction of highly competitive and aggressive species (guava, *tibouchina*, lantana, haole koa, and kiawe). Further, there was direct removal or alteration of the native forest for sugarcane, pineapple, and ranching activities, plus the introduction of feral goats, mongoose, and pigs. Exotic plants, particularly grasses, have invaded all disturbed areas and ecological niches within the park. Sections of the Mauna Loa Strip were most obviously affected by domestic stock. This activity has stopped and the vegetation is now recovering. Even the completely natural phenomenon of volcanic activity has destroyed some native vegetation. Recent flows have almost completely wiped out Naulu Forest, a small enclave of rare native species along the Chain of Craters Road. Fortunately, significant large areas of original vegetation still remain



intact and many individual rare native plants still exist within the park. The most important forest type is in the Olaa Forest tract, an area of almost 10,000 acres, which is probably the largest remaining tract of virgin ohia and fern forest in the Hawaiian Islands. This tract has been recognized by the Society of American Foresters as a "natural area," the best example of its type.

At Bird Park, many rare native plants have been replanted in an effort to keep them from extinction, including one of the world's rarest trees, the "hula Kuahiwi," or Hibiscadelphus Giffardianus. At the Naulu Forest there were other species of rare native plants clustered in a small area.

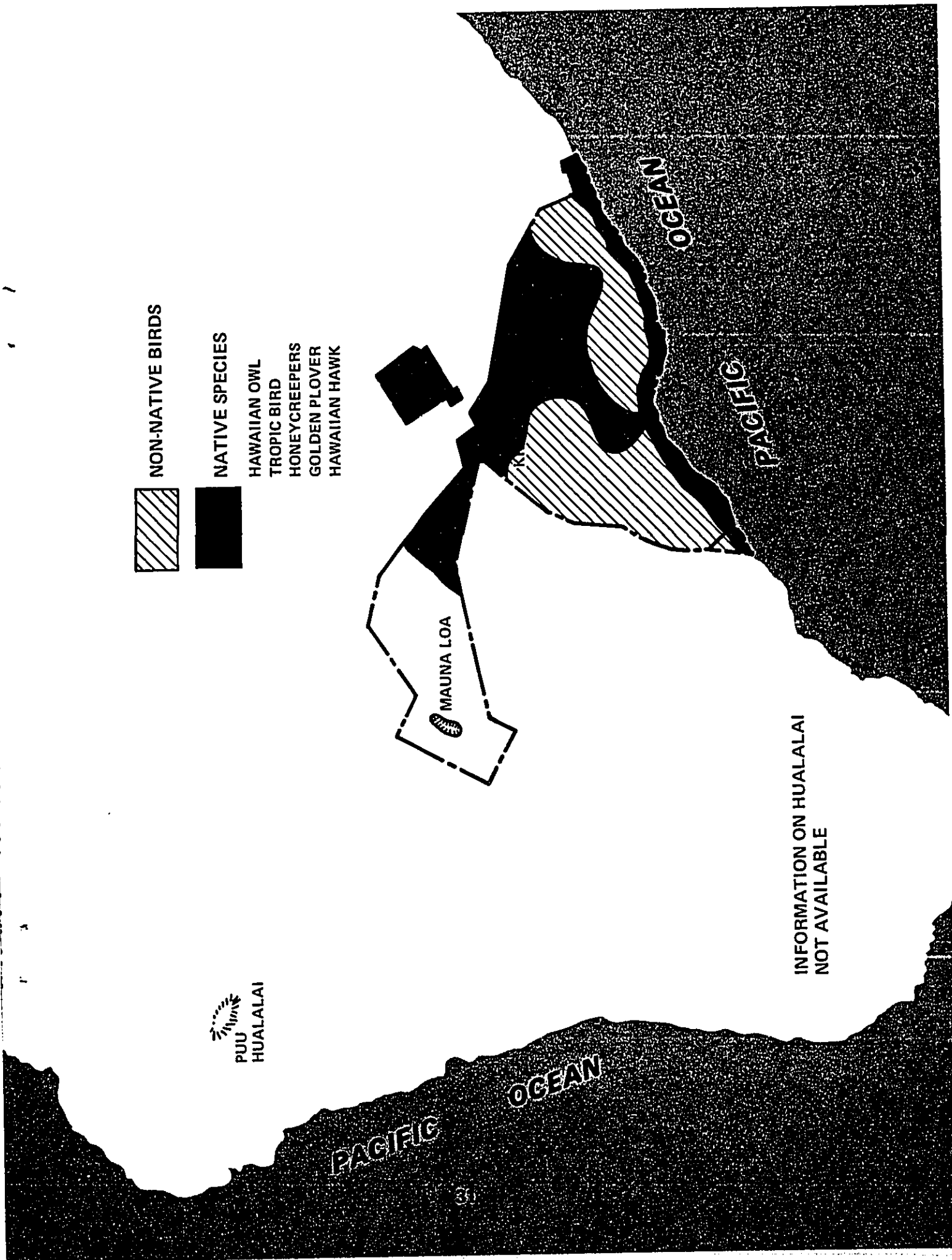
Animal Life

Birds are the most important aspect of the park's wildlife. Unfortunately, several endemic species have become extinct within the park and elsewhere on the Island because of many practices which disturb native habitats. Further, introduced birds are especially detrimental to the highly specialized Hawaiian honeycreeper family (Drepaniidae), which are of special interest to ornithologists and evolutionists. Included in this group are the apapane and iwi (common); amakihi (scarce); and creeper, akepa, ou, and akiapolaau (all recognized as rare and endangered species). Besides the honeycreepers, other endemic birds which range throughout the park are pueo (owl), amao (thrush), and elepaio (flycatcher). Io (hawk) and nene (goose) are found within the park, and are also listed by U.S.D.I. as "endangered."

The nene was once close to extinction but now appears to be out of immediate danger as the result of the efforts of many interested agencies and individuals. They once inhabited the lower coastal section of the park during their nesting period, but man's hunting and ranching activities, the heavy predations of mongooses, cats, and dogs, and the disturbances of goats and pigs, have eliminated nene populations and driven up to 5,000 below 8,000 feet.

There are six species of migrant sea birds including the endangered dark-rumped petrel, white-tailed tropic bird, American golden plover, ruddy turnstone, wandering tattler, and white-capped noddy. Exotic bird species are the California quail, chukar, ring-necked pheasant, Japanese blue pheasant, spotted dove, barred dove, skylark, Chinese thrush, red-billed leiothrix, mynah, white-eye, ricebird, house sparrow, cardinal, and house finch. The Hawaiian bat is the only native land mammal.

Feral goats have built up high populations in the open, drier coastal and high mountain sections of the park despite long-term reduction efforts. Recent feral goat populations in the 10,000 to 20,000 range have been reduced by half through vigorous annual reduction programs which have removed some 4,000 animals each year.



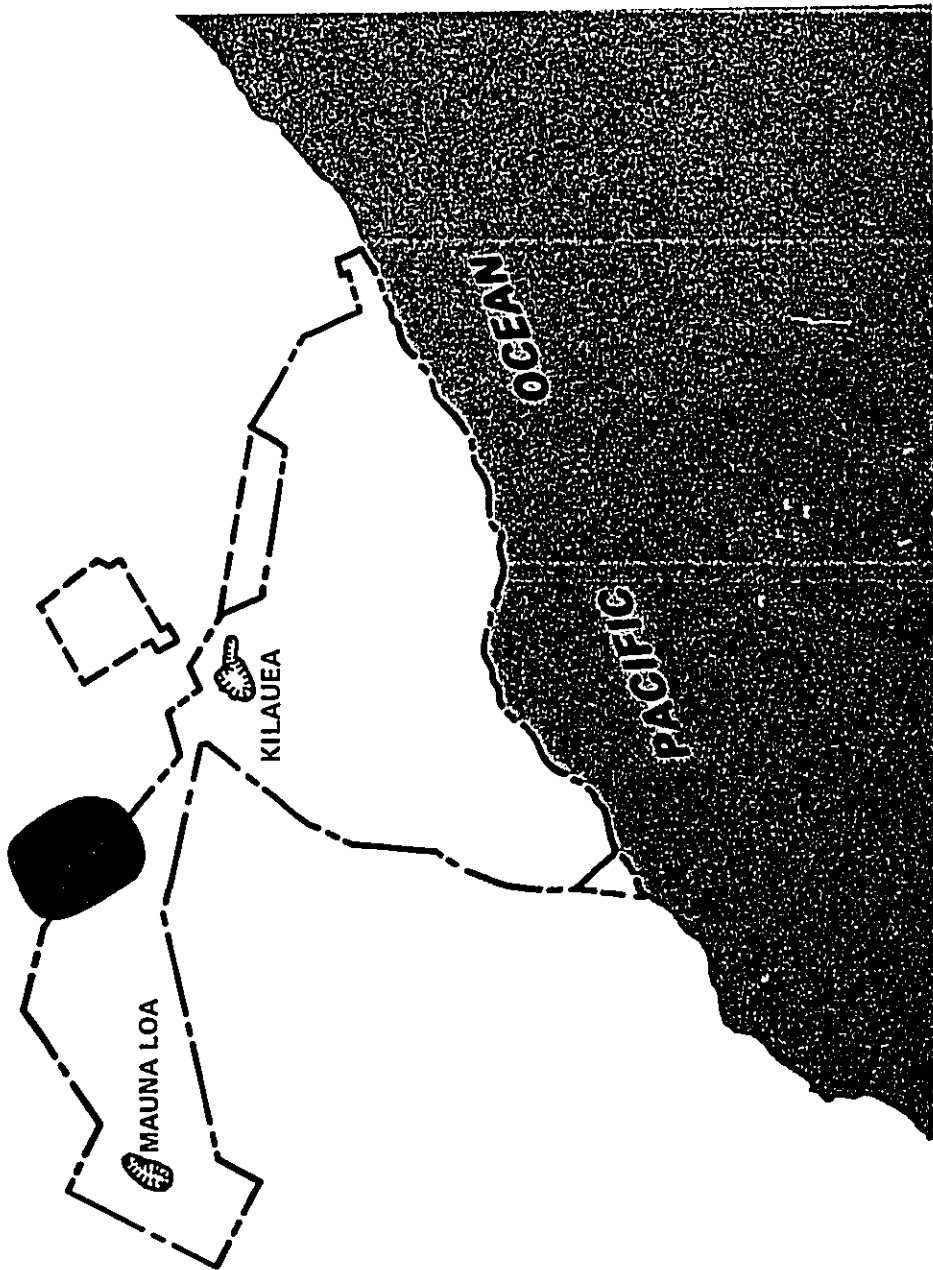
PUU
HUALALAI

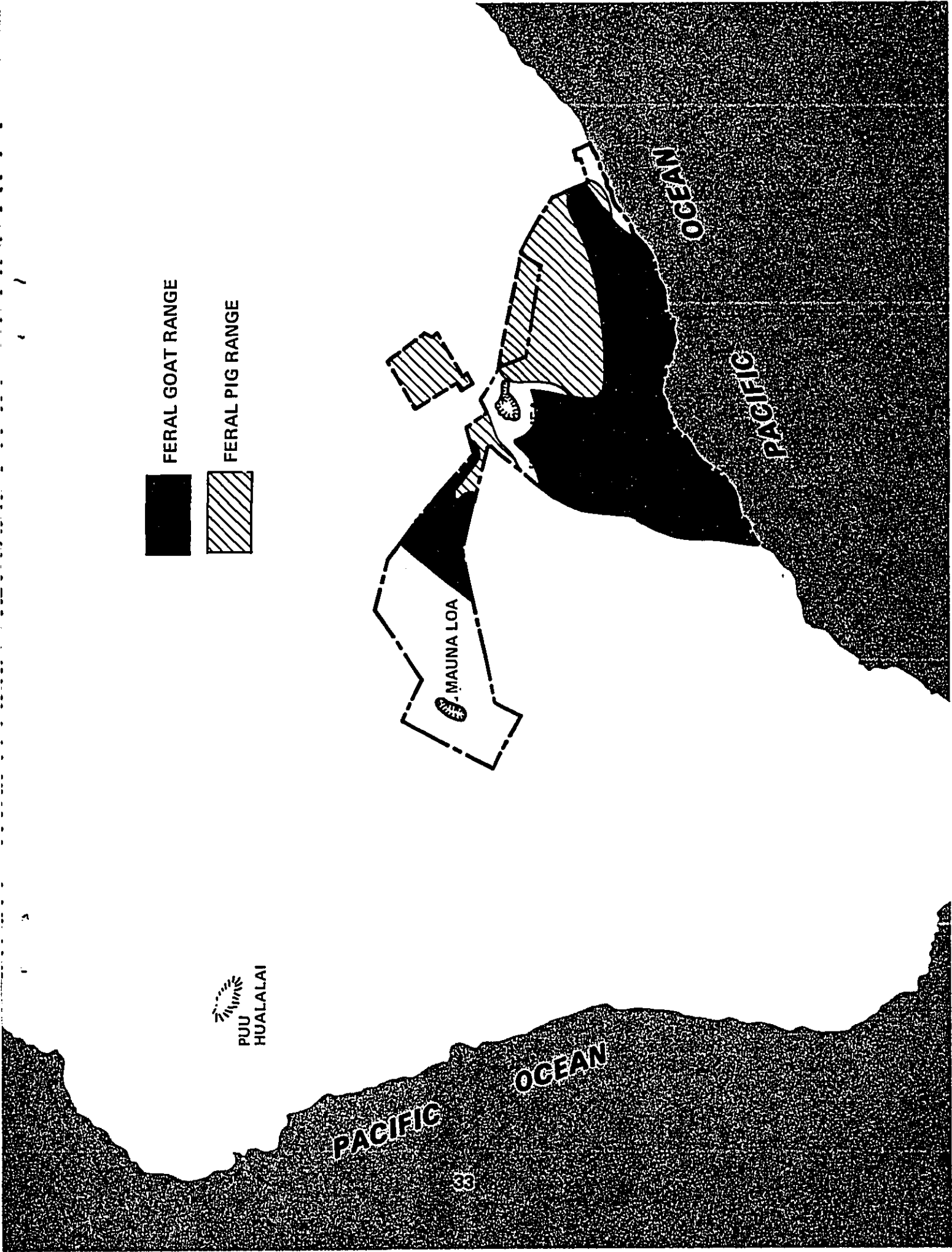
NENE GOOSE RANGE

PACIFIC

OCEAN

32





FERAL GOAT RANGE

FERAL PIG RANGE

PUU
HUALALAI

MAUNA LOA

The pig was brought to the Hawaiian Island by the Polynesians during their early migrations. These mixed with later European varieties, producing the strain of pigs that now inhabit the wetter forests and savannahs.

Feral goats, mongooses, and pigs have done great damage to the park vegetation and birdlife to an extent that cannot be accurately assessed without a continuing and extensive research program. Pigs have engendered the spread of exotic plants by carrying seed and scarifying the ground. Heavy goat browsing denudes the landscape of shrubs and prevents the regeneration of many native plant species.

No fish are found within the park, but there are excellent opportunities to view and study the colorful fish populations along the park's 30-mile coastline. Coral reefs are limited to a small area near Halape where common reef fishes include the squirrel fish, butterfly fish, Moorish Idol, surgeonfish, trigger fish, and several kinds of eel. Opihi, a species of limpet found on the surf-washed lava cliffs, is an important local delicacy.

History

Captain James Cook, R.N., discovered Hawaii for the Western World in 1778 and died at Kealahou Bay in 1779. His ships, the HMS Discovery and HMS Resolution, in 1779 navigated offshore from what is now Hawaii Volcanoes National Park, trading with the Hawaiians of Puna and Kau, exchanging nails, beads, and cloth for pigs, fruit, and salt.

The historic events that occurred within the park after Captain Cook first viewed the Puna-Kau coast are of value chiefly in their association with events that occurred elsewhere, and in the descriptions of the volcano and the coastal Hawaiian habitation recorded in accounts of early travelers. An explosive eruption of Kilauea was a historic factor in the eventual rise of Kamehameha as ruler of all Hawaii. In 1790, while enroute through the Kau Desert to battle the forces of Kamehameha, a portion of Keoua's Hawaiian army was destroyed by the volcano. Fossil footprints of some of the Hawaiian warriors still remain today in the Kau Desert.

Kilauea first felt Western shoes in 1823 when a band of Christian missionaries found the summit active and wrote such vivid and widely read descriptions that thereafter Kilauea was of prime scientific interest as well as a desired visitor destination. By the 1840's before Yosemite Valley had even been discovered, Kilauea Volcano had become a regular stop for tourists to Hawaii. They stayed in native-style huts until a commercial hotel, the Volcano House, was established on the rim in 1866. The Hawaiian Volcano Observatory was founded in 1912.

Pig-rooted area with the start of sucker growth by guava,
an exotic. It is felt that pig activity may stimulate
the spread of guava.



Hawaiians held the Kilauea summit sacred, and it was at Halemaumau, the principal vent of Kilauea, that the image of Pele, the volcano goddess, was weakened by the High Chieftess Kapiolani. She was a convert to Christianity who defied Pele in 1824 by eating ohelo berries without the traditional offering while also proclaiming the Christian god supreme.

Several relatively recent historic sites have been identified as important. One is the "Old Volcano House" of 1877 which still stands. Another is the Keauhou Landing Site which for a time in the middle 1800's was a landing for tourists coming to the Kilauea Volcano. The landing and village were virtually destroyed by the 1868 tsunami (tidal wave). A few coconut trees and remains of the old wharf are all that is left of what was once a fairly large village and steamship port.

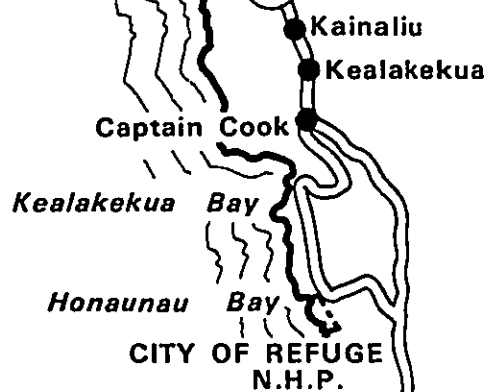
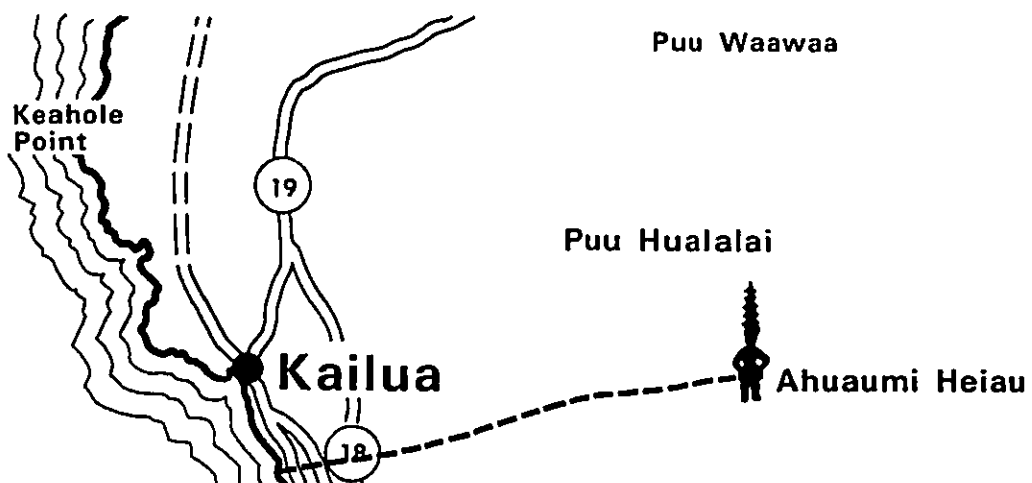
A third historic site of some significance, a ruin of a factory for producing pulu (a fern product), is located on the trail between Makaopuhi and Napau Craters.

Archeology

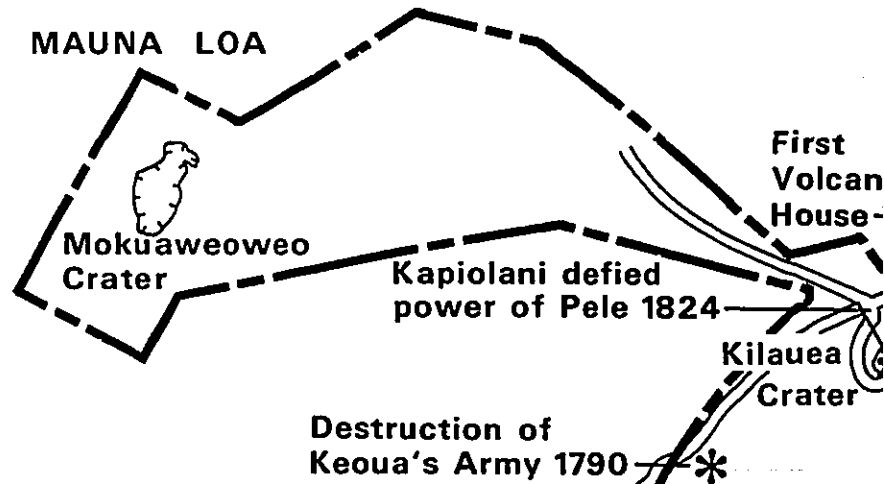
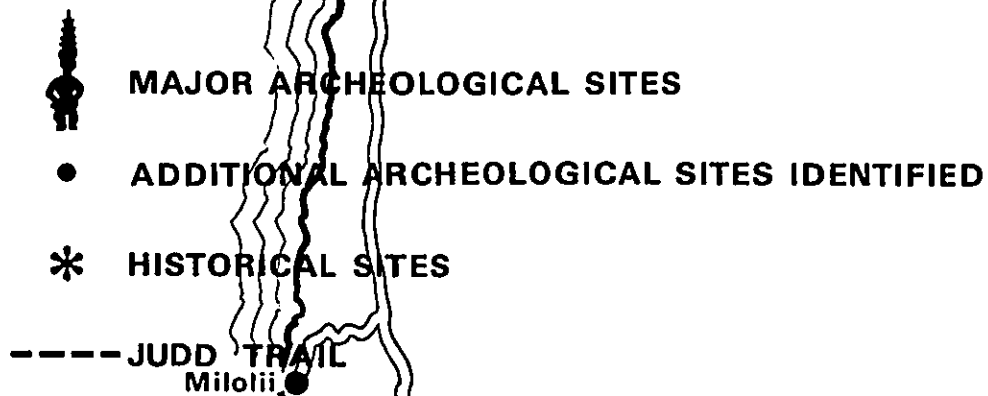
The park preserves one of the largest single accumulations of stone structural remains in the Hawaiian Islands and, therefore, is a rich source of research material. Much of the stone remains are, however, unsuitable for the recovery of detailed information. Deposits of habitation material are rare. Only about 9 or 10 sites are regarded as potentially suitable for excavation. The extreme rarity of such sites required that the utmost care be exercised in their investigation. In fact, it seems clear that some aspects of Hawaiian prehistory can best be investigated only within the park. Thus, functional interpretation of much of the park's archeological evidence remains uncertain.

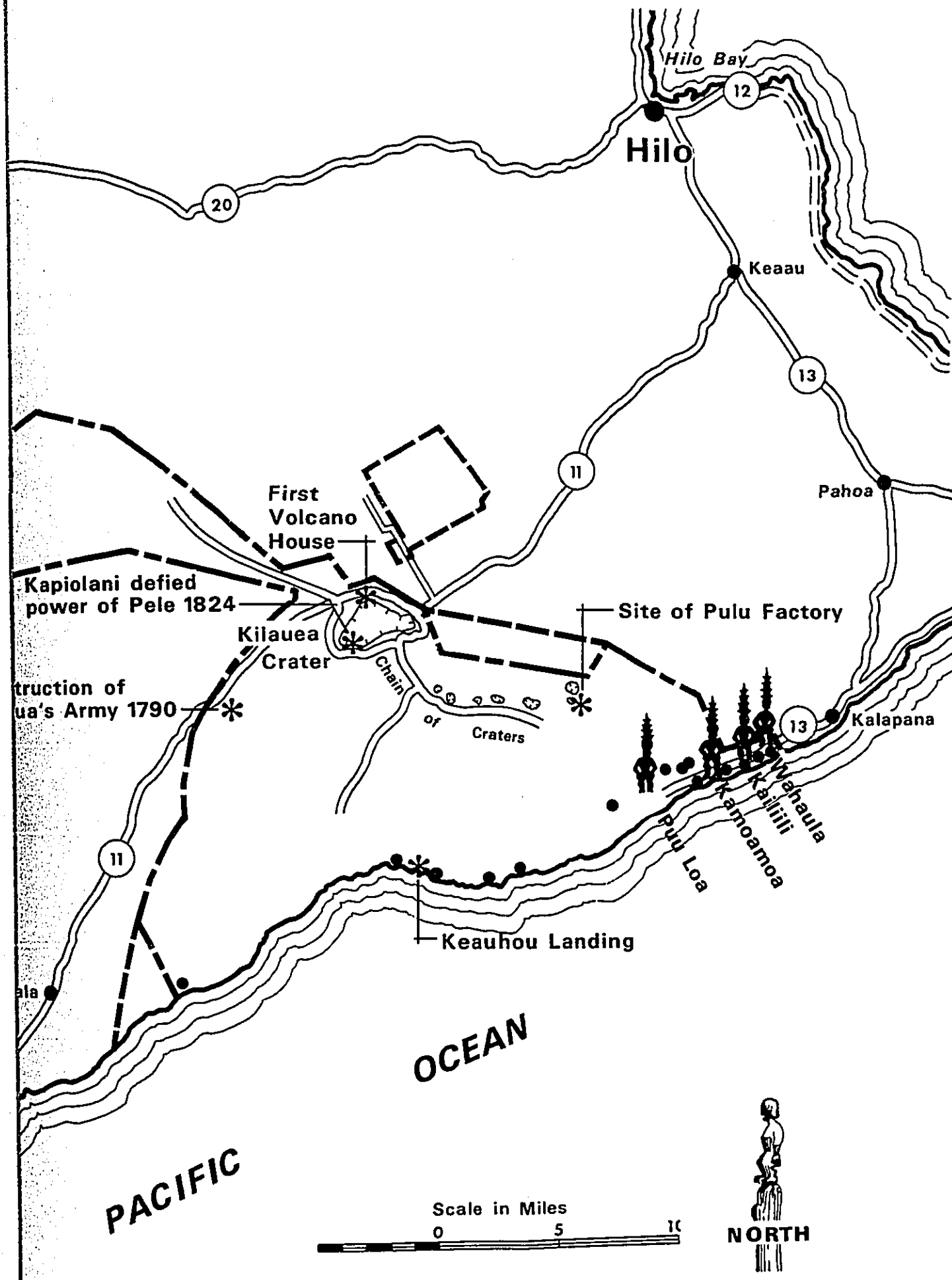
The sections of the Puna and Kau coasts lying within the park are rich in remains of villages, heiaus (temples), canoe landings, petroglyphs, shelter caves, and other evidences of native life. They represent various aspects of ancient and historic Polynesian culture. Sites situated in widely scattered sheltered areas along the rugged Puna Coast were occupied from prehistoric times until the middle 1800's. This sparsely inhabited coast and adjacent upland benches required special adaptation to severe environmental conditions. The people who lived here were mainly fishermen and farmers, and in the uplands some were bird hunters.

Archeological field work was not undertaken until 1959 when the Bishop Museum, under the Direction of Dr. Kenneth P. Emory, made the first extensive field survey. A second survey was made between 1963 and 1965 which continued the assessment of the park's archeological resources



HISTORY AND ARCHEOLOGY





and suggested avenues along which more detailed investigations might proceed. These surveys recorded 380 sites, but there are certainly many more. Between 1962 and 1968, several small sites were salvaged as part of the Chain of Craters Road project. Additional surveys of the entire park are now underway. Significant historic and archeological sites are in the process of being nominated to the National Register of Historic Places. Procedures for compliance with the National Historic Preservation Act of 1966 and Executive Order 11593 are discussed on pages 67, 69, and 70.

Wahaula Heiau--Red Mouth Temple--is one of the better known temple sites in the district of Puna. It is reported to have been established and constructed by the foreign chief Paa in A.D. 1275. Kailiili village site adjoins Wahaula and probably supported the temple. Culturally speaking, it is probably the only uncontaminated ruin in the Puna area. It has the distinction of being the only place along the Puna coast where iliili, small water-polished stones used for paving the temple and the house sites, are found. Moreover, this complex is the most important archeological area in the park and one of the most significant in the Hawaiian Islands, as it is important in the story of Paa and the introduction of the heiau luakini and the ritual worship of major Hawaiian gods. It is in remarkably fine condition and has an impressive appearance.

Site 911 is a small cave shelter west of Kailiili village near the coast which was used by the ancient Hawaiians as a shelter and an occasional overnight campsite from about A.D. 1300 to modern times.

Kamoamoa Village site represents an area where two periods of occupation appear to be superimposed. The ancient village appears to be farther back from the shore and the later (historic) development is toward the ocean.

The Puu Loa petroglyph field is the largest concentration of "rock carvings" in the park. It is located along an old Hawaiian trail inland from the village of Laeapuki. Many of the petroglyphs are ancient, as they have been almost completely obliterated by successive drawings and erosion. The petroglyph area is about 1/2 acre, one of the three largest in the Hawaiian Islands.

Recreation

The park encompasses a variety of terrain between sea level and 13,680 feet, with a wide range of climatic conditions. The resources, however, afford only limited use opportunities such as hiking, riding, nature study, and appreciation of geologic features. Lava flows and other volcanic features cover a major part of the park and there is no natural water source. The 30 miles of seacoast within the park are extremely rough with shore cliffs up to 100 feet, sparse vegetation, and a dry, windy climate. There are only a half-dozen trail access

Kamoamoa--An old Hawaiian village site on the Kalapana Coast. Some of the rock structures are ancient house platform and heiau remains. Others are historic cattle, goat, and house lot walls. The scene is typical of the park's coastline.



points to the ocean along the entire park coast. The areas of heaviest rainfall are covered with dense rain forest, difficult of access and contain important ecological values that are sensitive to the disturbances caused by development and use.

LANDS PROPOSED FOR ADDITION TO THE PARK

Large expanses of primitive land surround much of the park, particularly at higher elevations. Access has in the past been very limited by the rough character of the land, great distances involved, defense activities, high elevation, lack of water, and the fact that nearly all major development has historically been concentrated along the seashore or at least on lower elevations. Moreover, use of the land for grazing or for production of timber has proved to be a marginal economic venture at best. As land becomes more valuable, however, many such areas are being scrutinized in more detail to determine what their appropriate use should be.

The land described below encompasses generally that area around Hualalai Volcano, the intervening lands between that mountain and Mauna Loa, and the upper slopes of Mauna Loa.

Geology

Hawaii Volcanoes National Park contains only a small portion of Mauna Loa Volcano. The Mauna Loa strip is 1 mile wide near Kilauea, flaring out to 6 miles at the summit. Major geologic features lying within the park are the Mokuaweoweo Caldera and the upper portions of Mauna Loa's two rift zones. But about two-thirds of the major geologic features are outside the park. This includes the greater part of the dramatic southwest rift and the lower portions of major historic lava flows.

Hualalai rises 8,271 feet above sea level over the resort town of Kailua. It rests in the rain shadow of its lofty neighbor, Mauna Kea, and has thus suffered very little erosion. The last eruptions on Hualalai occurred in 1800 and 1801 when two voluminous flows poured from the northwest rift at the 5,500- to 6,000-foot level. Several lava rivers flowed seaward to form the Kaupalehu flow and overwhelmed Hawaiian villages on the shore.

About 120 cinder, spatter, and lava cones, more abundant than on Mauna Loa, dot the upper slopes of Hualalai. Some reach a height of 300 feet, but most are 100 to 200 feet high. Hualalai's summit is pockmarked by numerous pit craters and some of the larger summit cones contain crater depressions up to 500 feet deep. Eruptions from these cones have covered much of the summit area and the adjacent slopes with loose cinders and pumice.

An additional geologic feature of Hualalai is its abundance of xenolithic nodules, coarse crystal aggregates composed of olivine, pyroxene, and feldspar, that have been brought to the surface during an eruption. Because of their significance in deducing the genesis of basaltic magmas, they have received worldwide attention by earth scientists. Hualalai has progressed further in its "life cycle" than have Mauna Loa and Kilauea, making it attractive for cooperative study and interpretation.

Vegetation

The upper slopes of Mauna Loa from its summit to 11,000 feet are classified as unvegetated stone desert. Precipitation is light and there is year-round ground frost. Mosses appear at 11,000 feet on northfacing cracks of lava and in sheltered blister-holes. From the summit down to 8,000 feet is scattered low, gnarled pukeawe, ohelo berry, bunchgrass, and small ferns. At 8,500 feet on Mauna Loa and also on Hualalai, shrubs begin suddenly to grow taller and to be more densely distributed. Other shrubs and berries, such as pilo and kukainene appear. The ground frost disappears, precipitation increases, and clouds frequent the ground. Timberline is from 7,500 to 8,000 feet. Here, the ohia is a full-grown tree, and there is an occasional silversword in a small depression. An open ohia and mamani forest is established on the aa flows at 7,500 feet down to 6,600 feet and below the ohia-mamani forest there is koa and an occasional sandalwood.

At lower elevations to 4,000 feet, where rainfall greatly increases, the forest changes to a dense mix of koa and soapberry with tree ferns. Tall and well-formed ohia and koa are present in the "rain forest" belt between 3,000 and 5,000 feet. Unaltered Hawaiian rain forest is becoming rare, and only 23,000 acres are afforded full protection in Hawaii Volcanoes National Park. The remainder is subject to range and commercial forest development.

Moreover, at one time most of the interior plateau country was covered by fine stands of koa and sandalwood. Sandalwood stands were destroyed during the China trade period of the early 19th century. Other interior forests were further depleted by extensive cattle grazing and some were cleared for pasture. On Hawaii's Kona slope, only Honaunau Forest and another smaller section, Kahului Forest to the north, remain. Near Kilauea Volcano, the Kilauea State Forest Reserve also contains considerable botanical integrity. In recent years, ranchers have been fencing the lower lands up to 6,000 feet, so some recovery of sandalwood, mamani, and koa has occurred in the interior plateau. But the long-term effects of heavy cattle grazing are still noticeable in the Hualalai-Mauna Loa interior lands.

Rare and endangered plant species found within this area include various species of *Bidens*, *Santalum pilgeri* and/or *paniculatum*, *Cyanea carlsonii*, *Delissea undulata*.

Animal Life

The native Hawaiian Goose, the nene, may be seen occasionally on Hualalai's eastern slopes. The State Division of Fish and Game, in cooperation with the Bishop Estate, has established sanctuaries on the slopes of Hualalai and Mauna Loa (Keauhou Ranch) where nene are released and given protection. A third sanctuary and release site was established in 1967 on the Kahuku Ranch on the southwest slope of Mauna Loa between 6,500 and 8,500 feet, through a cooperative agreement with the Damon Estate. Seventy-five nene were released there.

There are a number of other endemic Hawaiian birds on Hualalai and the interior plateau. Among these are four honeycreepers: apapane, iiwi, amakihi, and creeper. Small numbers of the Hawaiian crow have also been reported in the Honaunau Forest and on Hualalai in recent years. They are among the very last in existence, and are on the United States Department of Interior list of endangered species.

In 1967, small breeding populations of another endangered species, the Hawaiian dark-rumped petrel, were discovered in the vicinity of Puu Keo, a 6,800-foot cinder cone on Mauna Loa's southwest rift. No other populations of this extremely rare and threatened seabird are presently known on the Island of Hawaii.

Exotic birds, including chukar, ring-necked pheasant, and dove, reside on the interior plateau and slopes of Hualalai, and feral goats, pigs and sheep are also present. They receive relatively light hunting pressure, as access to this region is limited.

Archeology and History

There are two sites worthy of mention in the Hualalai vicinity, Ahuaumi Heiau and the Judd Trail.

Ahuaumi Heiau is an ancient Hawaiian rock feature on the barren interior plateau between Hualalai and Mauna Loa. The first known drawing of the heiau was made by Lieutenant Charles Wilkes in 1841, and surprisingly, this site represents the type of dry masonry construction usually found in the major Hawaiian temples close to the coastline. Wilkes wrote of the heiau:

After a day's travel they (his men) reached the site of the ancient temple of Kaili. These ruins lie equally distant from three mountains, Mauna Kea, Mauna Loa, and Hualalai. This temple is said to have been built by Umi, who with his wife, Papa, is supposed to have inhabited it when he was king of the

Judd Trail in the saddle area between Hualalai and Mauna Loa.



island. The northern pyramids forming the front were originally erected by Umi, to represent the districts of the land he then governed; and as he conquered other districts, he obliged each of them to build a pyramid on the side of the temple. All these are built of compact blocks of lava, laid without cement. The building is said to have formerly been covered with idols, and offerings were required to be brought from a great distance, consisting generally of provisions. There are now no traces of these idols. The situation of the temple is at an elevation of 5,000 feet above the sea.

Other stories present the feature as ancient Hawaii's first census, with each district contributing a stone for each man, woman, and child, with the largest pile indicating the most populous district. In addition, the Kaili title may refer to the family war god, Kukailimoku, held by Umi and passed down to Kamehameha the Great in historic times. This title, with a plan of the structure drawn by Wilkes, lends credence to the structure being a major ancient temple. Research now underway on ancient Hawaiian temples may shed greater light on its significance.

The Judd Trail, a typical two-horse Hawaiian trail of the mid-1800's, was an attempt to connect Kona with Hilo in a more-or-less direct line. Built by taxpayers and prisoners who worked side by side under the direction of Gerritt P. Judd, M.D. (missionary turned into His Majesty's Minister of the Interior), trail construction was aborted through two major causes: the 1859 lava flow from Mauna Loa which crossed in front of it and left new land surface too hot to handle, let alone walk over; and the logistics of supply for a work gang getting farther and farther from food and water. Remnants of the trail are well preserved and its story is an interesting sidelight on the transportation history of Hawaii.

Special Considerations

The Hualalai summit area, the upper slopes of Mauna Loa, and the interior plateau lands are in large blocks of private, State, and Federal ownership, lying above productive farm and ranchlands. The only significant development is the Mauna Loa Observatory, a research installation occupying a 4.05-acre tract of State land at the 11,150-foot elevation. The location is important because of cloud-free conditions, the absence of vegetation and insects, and because other favorable upper-altitude research points, such as Haleakala, have become quite crowded, creating unfavorable conditions for sensitive research.

There are three principal landowners--the B. P. Bishop Trust Estate, the Samuel M. Damon Trust Estate, and the State of Hawaii. Almost all the lands are within State Conservation Districts.

The B. P. Bishop Estate manages the lands of the late Princess Bernice Pauahi Bishop for the support of the Kamehameha schools. They include most of the Hualalai summit, forest lands between Hualalai and the Kona Coast, the saddle area between Hualalai and Mauna Loa, and lands above the City of Refuge.

The Samuel M. Damon Trust Estate owns Kahuku Ranch, which extends from the park boundary at 12,500 feet on the southwest rift of Mauna Loa to the ocean. Their holdings contain the greater portion of the upper southwest rift slopes. State of Hawaii lands, essentially barren, are above the 8,500-foot level on Mauna Loa and in a small tract on Hualalai.

Current recreational use of these lands has been limited to a minor amount of pig and goat hunting up to the 8,000-foot level and some game bird shooting on the lower slopes of Hualalai and Mauna Loa. The best hunting is at 6,000 to 7,500 feet. Nearly all hunters are local residents who obtain permission from ranchers or landowners. There is some snowplay activity at the Mauna Loa Observatory, during the winter. Mainly, however, such use is limited to the summit of Mauna Kea.

Weather conditions are vastly different from those on the nearby sunny Kona Coast. At the higher elevations on Mauna Loa and Hualalai there is almost daily occurrence of dense fog, the band of greatest concentration being from 6,000 to 10,000 feet. This condition usually starts developing in midmorning and persists until early evening. In the winter months there is often snow on Mauna Loa down to 9,000 feet. Depths range from a few inches to a foot during any one storm.

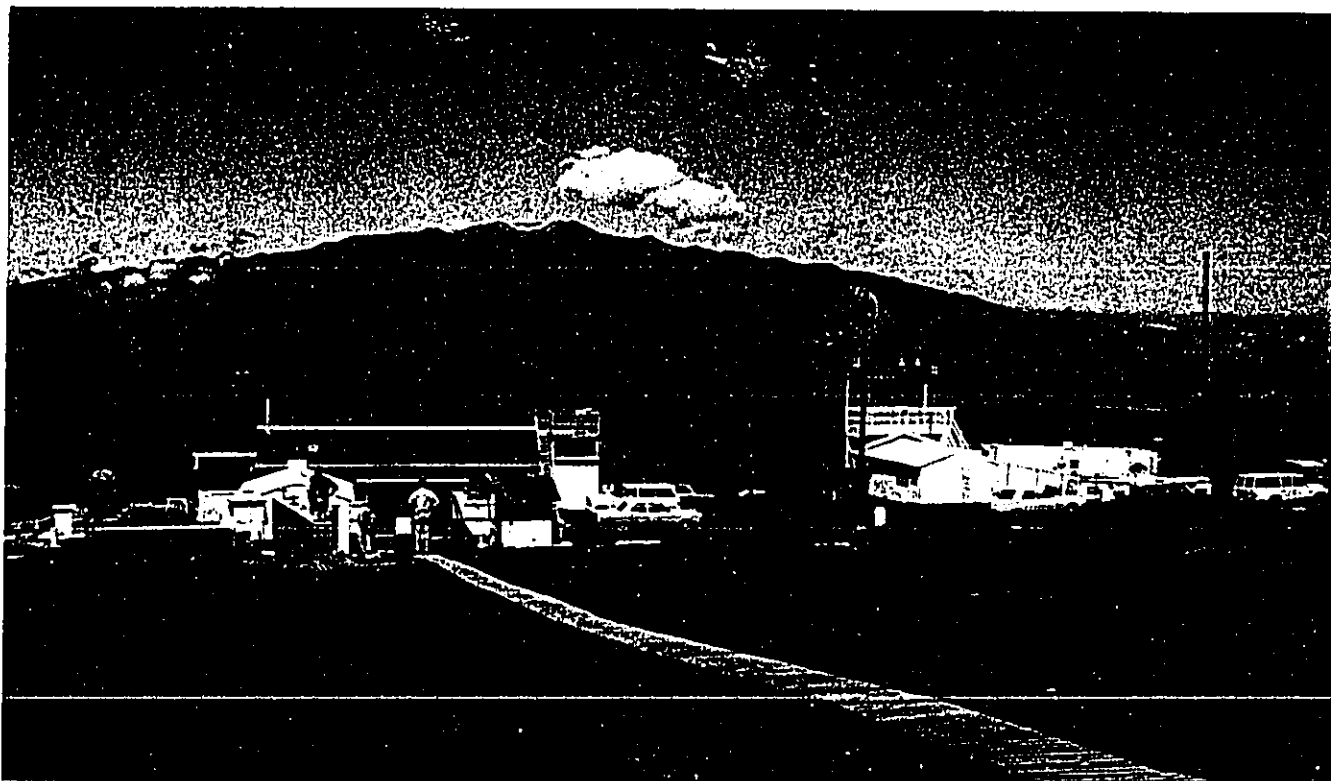
PLANNING CONSIDERATIONS

Legal

The Congressional Act of August 1, 1916 (39 Stat. 432) authorized Hawaii National Park on the Islands of Hawaii and Maui in what was then the Territory of Hawaii. The act gave the Secretary of the Interior authorization to permit the erection and maintenance of buildings in the park for scientific purposes. Subsequent acts extended the boundaries of the park: Act of May 1, 1922 (42 Stat. 503); Act of February 12, 1927 (44 Stat. 1087); Act of April 11, 1928 (45 Stat. 424); and the Act of June 20, 1938 (52 Stat. 781).

The park was created from federally owned lands and donation from the Territory of Hawaii (later the State). The Act of February 27, 1920 (41 Stat. 452), authorized the Governor of the Territory to acquire privately owned lands and rights-of-way within the boundaries of the park.

Mauna Loa Observatory on the northwest flank of Mauna Loa.
This facility will be within the proposed park boundary.



The 1938 act also had special restrictions regarding land acquisition. It stated:

That the United States shall not purchase, by appropriation of public moneys, any land within the aforesaid area but such lands shall be secured by the United States only by public and private donations.

The Territory, and later, the State of Hawaii, acquired most of these lands for the United States through donation, exchange, and condemnation with purchase.

Further, section 3 of the 1938 act gave the Secretary of the Interior the discretionary authority to allow homesite leases within the Kalapana Extension to Hawaiians. It also restricted fishing along the coast to native Hawaiians of the Kalapana area and persons guided by them. The term "native Hawaiian" is defined as any descendant of not less than one-half part of the blood of the races inhabiting the Hawaiian Islands previous to 1778.

Exclusive jurisdiction for park lands was assumed by the Federal Government by an act of Congress on April 19, 1930 (46 Stat. 227). There were also later amendments to this act.

The Olaa Forest Tract of 9,654.00 acres was obtained by donation of ceded Territorial lands in 1951 and 1953 (Executive Order No. 1640 by Territorial Governor Long, November 28, 1952). Title is vested in the Federal Government, and the National Park Service has protective custody though the land is not a part of Hawaii Volcanoes National Park. Under the terms of the 1938 extension act, all lands acquired must be adjacent or contiguous to the existing park boundary, and the Olaa Forest Tract is separated from the park by small parcels of private intervening lands.

In 1961, Congress changed the designation of the park on the Island of Hawaii to "Hawaii Volcanoes National Park," (75 Stat. 577), approved September 22, 1961, and created a separate national park, "Haleakala National Park," on the island of Maui.

Current gross park acreage is 220,344.84 acres not including new lands added by the recent Mauna Ulu eruptions. Of this, 210,462.17 is federally owned and 9,882.67 is privately owned. The Olaa Forest Tract, mentioned above, is not included in this acreage figure. The most recent land acquisitions, in 1972, were Ainahou Ranch of about 6,324 acres and a small 39-acre parcel near Thurston Lava Tube.

Climate

Weather is an important influence in determining the current and future visitor-use pattern. The climate at the 4,000-foot elevation around

Kilauea is too cool and damp to be conducive to pleasurable overnight use, particularly when compared to the warm coastal areas where resorts are located. In 1951, there were only 15 days when no rain fell on the Kilauea area, and mean temperatures range from 50 degrees to 70 degrees Fahrenheit. The accompanying graph indicates the great range in temperatures in different sections of the park.

Rainfall varies greatly throughout the park and from year to year. One particular year may have 2 to 3 times as much precipitation as another year. The wettest parts of the park are on the northeast or trade wind side of Kilauea. At park headquarters the average annual precipitation is 99.9 inches while 2 miles from headquarters on the Kau side of Kilauea Crater, near the proposed location of the major interpretive center, the average is 48 inches.

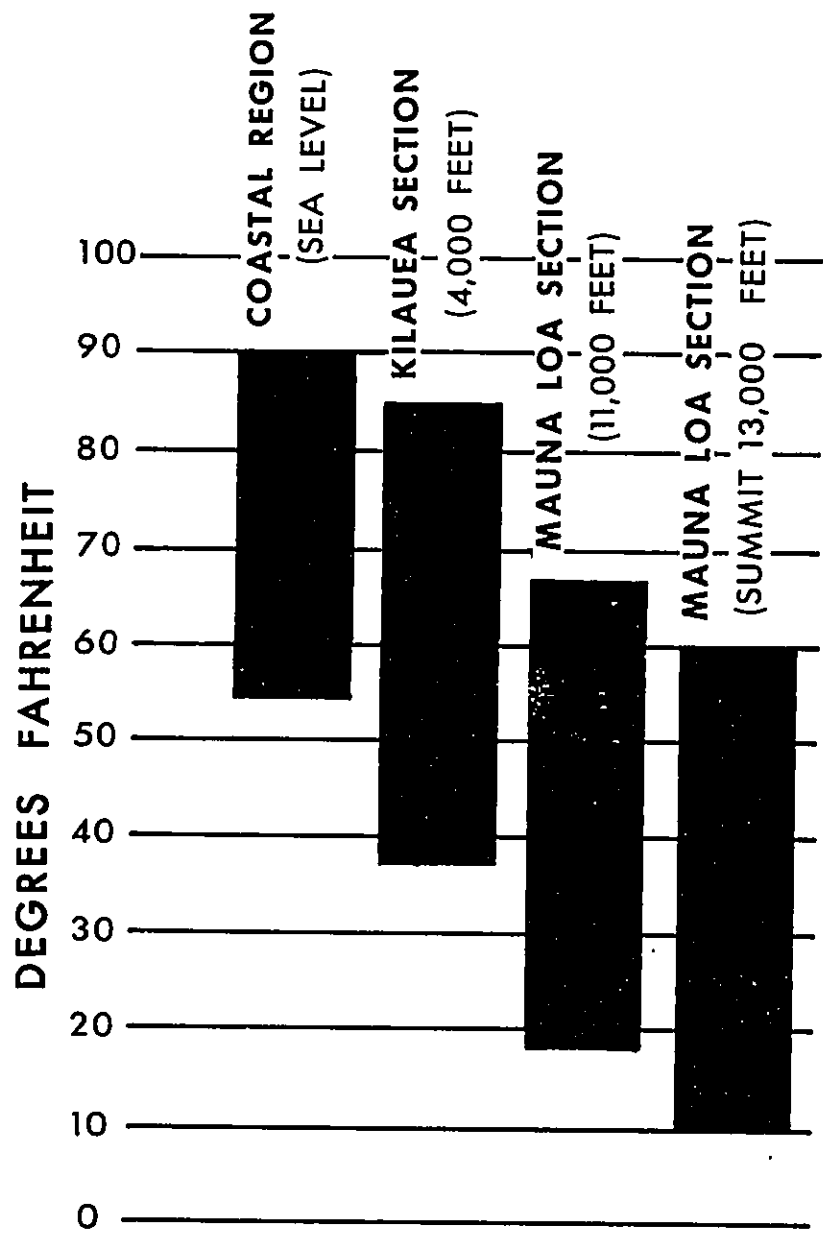
Along the ocean the rainfall varies from 15 to 60 inches annually. At the summit of Mauna Loa the average annual rainfall is 15 inches. Snowfall occurs at times above 9,000 feet where depths up to a foot have been noted. There generally is a mantle of snow on Mauna Loa for several months during the winter. Frostline is at about 5,000 feet.

Several special conditions are also worthy of mention. Heavy rainstorms over periods of several days occur with rainfall in amounts from 15 to 20 inches. Electrical storms are infrequent and mild, but may occur any month. Strong tropical winds (Kona winds) blow once or twice a year, inflicting damage on buildings and vegetation and causing minor flooding to the pali sections of the park. The entire park lies within the storm track of Pacific hurricanes. The northeasterly trades prevail from March to November. Their velocity is generally 10 to 20 miles per hour, with higher gusts in exposed areas. There is also a tsunami (tidal wave) danger along the low sections of the park coastline. Points above the 50-foot contour are considered safe.

The Civil Defense Agency warns backcountry users of potential tsunami danger as part of the Statewide warning network.

Special Conditions

The most obvious condition unique to Hawaii Volcanoes is the frequent volcanic eruption. In the past 3 to 4 years, activity has been almost constant and has covered about 20 square miles of the park with new lava including about 10 miles of road, created some new land where previously there was ocean, covered many acres of vegetation, and completely changed the face of the land in many locations. Each new eruption or change in eruption pattern stimulates new and heavier visitation and creates the obvious problem of safety, often in areas inaccessible by road or previously not frequented by visitors. Moreover,



TEMPERATURE EXTREMES

since 1969, eruptions have caused 50 to 100 fires per year. Much of the acreage burned, however, has since been covered by more recent lava flows.

Since much of the park is covered by unweathered lava, there is little soil depth and permeability is excellent. There is soil consisting of weathered ash deposits up to several feet in depth at Kipuka Puauulu, Kipuka Ki, and elsewhere on the lower slopes of Mauna Loa.

Water availability is especially significant. Even with heavy rainfall the water table is low just above sea level. Due to the extremely porous fresh lavas, there are no running streams in the park and few on the Island. Water for domestic use in the Kilauea area is collected from extensive rain sheds. Current storage capacity is about 8 1/2-million gallons, and is inadequate. A project currently underway will tie the Kalapana area into a county water system adjacent to the park.

Other dangers are also present in the park. High surf dashes against the base of the cliffs, presenting a danger to shore fishermen and shellfish gatherers. Volcanic cracks throughout the Kilauea area make building-site selection difficult and are a hazard, especially in heavily vegetated areas. Water mains must be placed above ground to prevent ruptures from quake activity. This same activity also causes road damage along the park roads.

Finally, there are special cultural considerations unique to Hawaii. The existence of numerous historic and archeological sites must be protected in any development and use program, even though many of these may not be suitable for interpretation. More important, even where it is determined to stabilize and interpret specific ruins, special care must be taken since most living Hawaiians have considerable reverence for their cultural past and insensitive treatment of physical remains may further diminish a culture that has already been greatly affected by European and Asian influence.

Visitor Use

Visitor use at Hawaii Volcanoes National Park is year-round, 90 percent day use, and increases greatly during periods of volcanic activity. It is usually more than 100,000 a month year-round. Total yearly visitation has gone from a little over 300,000 in 1950 to 1,400,000 in 1972. Particularly heavy visitation occurs during eruptions at which time the concessioners overnight facilities are nearly always full.

Park visitation is essentially from three basic sources. Over 50% are off-island visitors, both on commercial tours and those driving rental cars. Other visitors come from Kilauea Military Camp or are local island residents.

Halemaumau Overlook--A facility similar to this was closed to visitor use only hours before it fell into the active crater below.



The majority of off-island visitors see the park in organized tours. Kilauea is a major stop on the Hilo-Kona (and reverse) tours. Seven companies serve the park, using 11-passenger limousines and larger conventional buses. They carried almost 400,000 visitors through the park in 1972. In the summer, 1,200 to 1,500 persons tour the park each day; the "off-season" average is about 800 to 1,000. The tours are usually in the park between mid-morning and mid-afternoon and almost all make a lunch stop at the Volcano House, where from 800 to 1,500 are served each day.

The balance of off-island visitors see the park in rental automobiles. There are presently about 500 rental cars available on the island and on the average, 75 percent of the cars rented each day are driven to the park.

Residents use the park somewhat less than off-island tourists, but make up a greater portion of eruption-viewers. They also come to picnic, sightsee, hike, and, to a limited extent, to camp and fish. The farthest islander resides within a 2 1/2-hour bus drive of the park and more than half the 62,000 residents live within an hour's drive. Their use is almost entirely during the day.

Park visitation increases greatly during period of volcanic activity. Thousands of people flock to the park, mostly between dusk and midnight, to see the vivid eruption displays wherever they occur. Crowds of 20,000 a night have witnessed the more dramatic eruptions.

The continuing rise in park visitation noted earlier is the result of the tremendous increase in tourist travel to the Hawaiian Islands and the increased popularity of the "Outer Islands." The completion of the Chain of Craters Road in 1965 further stimulated use by opening a one-day loop trip through the park from Hilo. And even when the road was subsequently closed by an eruption in 1969 and still remains closed, visitation continues to increase. The predominant effect of the road closure is the limited use of the Kalapana Coastal area.

Limited recreational resources such as beaches or small bodies of water, plus the damp cool climate of the Kilauea area greatly limit the usual overnight camping use associated with most large mainland parks. Local residents tend to prefer this activity to be associated with the island's warm beaches and shoreline where they will be near opportunities for fishing and swimming.

There are, however, three small campgrounds with a total of 22 sites at Kamoamoa (along the coast near Kalapana), Hilini Pali (at the 2,200-foot elevation), and near Namakani Paio near Kilauea. In 1972, these accommodated about 2,500 overnight visits, more than double what was recorded in 1967.

Three types of visitor overnight accommodations are located on or near the Kilauea caldera rim. The original Volcano House and its successors have been used by visitors from all over the world since 1866. The present structure is an 83-guest-capacity lodge directly on the Kilauea caldera rim, and is operated by the parks concessioner, C. Brewer Corporation. The return of almost constant eruption activity and a recent upgrading of that facility have been at least partially responsible for the greatly increased use at this facility. The occupancy rate during the peak month of August 1972 was 100%.

Namakani Paio Campground includes a 10-unit camper cabin facility operated by the park concessioner. It was constructed by the National Park Service in 1965 to provide low-cost overnight accommodations. Each unit sleeps four and has an outside picnic table, grill, and lights.

Use of this facility was initially very light, but has been growing. Heaviest use is in the summer and during eruption periods when the average occupancy approaches 100%.

Kilauea Military Camp provides a complete, year-round, recreational vacation program within its 50 acres for active and retired members of the Armed Forces and their families. The camp is on the Kilauea rim and provides overnight accommodations for 300 people. Its program includes guided tours of the park and surrounding points of interest. The camp operates under a National Park Service special-use permit and has been in existence since 1916. It is administered by an Army officer who has a 57-man complement of Army, Navy, Air Force, and Marine Corps personnel, and 24 civilian employees. It operates at capacity during the summer and at 55 percent capacity during off-season, but off-season use is increasing.

Day-use activities are varied both in scope and in popularity. Automobile and bus sightseeing is the most popular activity and enjoyed by virtually all visitors as many points of interest are made available by over 40 miles of good park roads and can be readily seen in one day.

Two air-tour companies run daily flights which include the park and use of these is steadily increasing. During periods of exceptional eruption activity, the island airlines and charter services make numerous flights over the eruption site sometimes resulting in air congestion.

Audio-visual programs throughout the year as well as exhibits at the Kilauea Visitor Center are a major part of the interpretive program. Daily programs include a talk and a color film presentation of recent eruptions. This program is geared to the tour pattern, but is suspended during periods of unusual eruption activity when interpretive contact is shifted to the eruption site.

Hundreds of persons daily hike the three short interpretive trails in the park; Devastation, Bird Park, and Thurston Lava Tube. Halemaumau Trail across the floor of Kilauea caldera is a long, 3-mile nature trail that receives much less use and the Footprints Trail in the Kau Desert has only light use. Rough trails to eruption overlooks are built as needed; and as many as 100,000 persons are estimated to have used the trail to Mauna Ulu Crater rim in 1972 while the eruption was continuous there.

Fishing from the park shoreline is done by hook and line, throw net, and spear. The coast from the Puna-Kau District line west to Kapao Point (15 miles) is open to public fishing. Access to this area is by trail. The remaining 15 miles of coastline, known as the Kalapana Extension, is limited by law to sport and commercial fishing by native Hawaiian Kalapana residents and persons under their guidance. The rough ocean waters greatly limit activities such as boating, swimming, scuba diving, and skin diving.

There are three small picnic locations around the Kilauea area, two along the pali section, and one at Kamoamoa on the coast. Use is light due to frequent wind and rain, particularly at higher elevations.

Backcountry use, especially overnight camping, is also increasing. In the 1960's, only about 1,000 to 1,200 persons per year stayed overnight in the backcountry. In 1972, the number was about 2,500. This increase has occurred despite the rough terrain and lack of fresh water. Most use is along the coast below Hilina Pali where there is access to good fishing at Halape, Kakiwai, and Apua Point. There is also some use of the trail to Mauna Loa's summit, where two cabins open to visitor use provide minimum shelter in this cold climate. One is at Red Hill at the 10,000-foot level and the other is at the eastern edge of the summit caldera.

ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

The goal of the master plan proposals is essentially threefold. First, the visitor will be provided with the opportunity for a great variety of park experience, from visiting the rim of Kilauea Crater or new eruption sites such as Mauna Ulu to view the spectacle of volcanic activity, to the wilderness experience of hiking along the coast or to the top of Mauna Loa. Second, the complex of Hawaiian ecosystems will be managed to maintain it as nearly as possible in its natural state and protected from further invasion by exotics as well as attempt to return disappearing native species to their former range. Third, the active volcanic features and their environs will be managed in such a way as to provide optimum conditions for continuing volcanic research.

To accomplish this goal, specific actions will be necessary. There are boundary proposals, new developments, new management practices, and research. Each has its own specific impact but all have the overall effect of helping to insure that this complex geologic, biologic, and cultural resource will retain its integrity but at the same time continue to be available for the enjoyment of visitors now and in the future. Discussion of more detailed impact follows.

BOUNDARIES AND LAND ACQUISITION

Included here are both lands to be acquired within the authorized boundary and that land requiring a change in the park boundary. There is no existing human habitation on any of the land proposed for acquisition except at the lower end of the Hualalai road right-of-way.

Land Parcels Within the Authorized Boundary

Since the Olaa Forest Tract is already Government owned and administered by the National Park Service, the only action proposed is to make it officially a part of Hawaii Volcanoes National Park. The only impact of this action is that management and development of this parcel will become less complicated. The amount of money or manpower thus saved is unknown, but minimal if not negligible.

Deletion of Tract 20, northeast of Kilauea, will have the predominant impact of saving the cost of acquisition. There are no known historical or archeological values present. The land is probably worth about \$5,000.00 per acre. Its being deleted from the park boundary will result in no change in the existing land-use pattern, nor will there be any known change in management, since the Federal Government has heretofore had no involvement in how the land was used. The only known impact on the remainder of the park is that as a result of probable increased development, immediately adjacent park land will be in greater danger of encroachment by exotic plant species. Nearly all the land thus affected contains concentrated park development, except Kipuka Puauulu or Bird park, in which several rare, endemic species of plants and birds are found.

The impact of adding Tract 22 is that an additional 6,000 acres of virgin ohia and fern forest will be placed under the permanent protection of Federal ownership. Alternative uses of this parcel are few--sub-division and harvesting the fern trunks for carvings of kihis. The latter is a lucrative business on the Big Island, and many areas are still available for such harvesting. Use for residential purposes must be considered marginal because of heavy rainfall, cool temperatures, and because it lies directly adjacent to an active portion of Kilauea's southeast rift. Because of these facts and since there is little use made of the land now, the impact on the present landowner is minimal.

Only about 420 acres of Tract 19, near Kalapana visitor center, is proposed for acquisition. The impact of this action is associated with the adjacent Kalapana road, the visitor center, and the heiau at Wahaula, in that it will be an open space buffer zone for those facilities and will help preserve their integrity, particularly, the historic heiau and its surroundings. There are no known archeological values of note on the land proposed for deletion. Alternate use of land is as a subdivision, similar to the remainder of Tract 19 which, as a result of being deleted from the park, will become more heavily residential.

As in the case of Tract 20, there will be a continuing danger that exotic plant species will invade park land directly to the west as residential development brings with it a great variety of these plants for landscape use. Impact on park operations is negligible because the land to be acquired is small in comparison to the total park acreage. For that portion to be deleted from the park the only major impact is economic, as it will not be necessary to purchase nearly 3,500 acres of land at an average of about \$3,000.00 per acre.

Tracts 26 and 27, near Kapao Point, are part of the geological phenomenon called the Great Crack. Acquisition of these lands will complete the inclusion of this major physical feature within the park boundaries. Possible alternate land use is grazing, and this is considered marginal. Resort development of this coastal area is generally sub-marginal because of wind, remote location, lack of beaches, and rough lava shoreline. Therefore, the impact on the present landowner is minimal.

Proposed Boundary Additions

Addition of 5,400 acres of tideland and water will extend the protection of national park status to 1/4 mile from high tide line. Acquisition by the National Park Service will result in more intensive management than is feasible by the State of Hawaii due to difference in intent and to limited available funds. Such management will mean that species of sea life harvested elsewhere, such as opihi, might be more carefully controlled here, thus helping to insure their continuation. The State of Hawaii owns and manages all other tidelands, and transfer of a portion of this to the Federal Government will mean some increase in cost since two managing agencies will be involved in a single resource

type. The added cost will accrue to the Federal Government, probably a maximum of \$15,000.00 per year. Impact on visitor use will be negligible since all access to the shoreline is already within the park boundary. There are no known alternative uses of this particular parcel.

The largest proposed park addition is the Hualalai-Mauna Loa complex consisting of 100,000 acres. As a result of this acquisition, two major land forms will be added to the national park--the summit of Hualalai Volcano and the upper flanks of Mauna Loa Volcano. Furthermore, the resulting land management practices will be, in essence, an attempt to preserve native populations endemic to that particular location and to control competing feral and exotic species. For visitor and island resident alike, another facet of Hawaii's varied geologic and biotic environment will be accessible for public use and appreciation.

The impact on the land use pattern, and therefore on the present owners, will be minimal. The upper slopes of Mauna Loa, being unvegetated lava fields, are unused except for the Mauna Loa observatory, a research installation which will remain. The saddle area between Mauna Loa and Hualalai likewise supports no existing or potential use except for occasional hunting for pigs, goats, or sheep. Grass cover on the extensive cinder fields is sparse to non-existent so that grazing would be, at best, marginal. Hualalai's summit area is more heavily vegetated, especially on the west slopes, and grazing could take place here. Again hunting use is very light because of difficult access and the necessity to obtain permission from landowners.

Acquisition of the road right-of-way from State Route 11 to the proposed boundary is the only such action involving residences and an active agricultural industry--mainly coffee plantations. Depending upon the specific right-of-way location, it is estimated that a maximum of 5 residences would be disturbed and not more than 2 acres of agricultural land would be removed from production. The remaining right-of-way acreage is predominately forest cover with grazing as the only existing use that would be terminated by acquisition.

MANAGEMENT AND RESEARCH

The total impact of the National Park Service management and research program is that endemic plant and animal populations will have a much greater opportunity for survival than would be possible without these programs. Moreover, species that have disappeared from major portions of their original habitat will be, to the extent possible, reintroduced. The cumulative effect of such a program, if successful, will be that by re-establishing certain plant communities, rare and endangered birds--particularly the Hawaiian crow--that are dependent on that habitat will have a greater chance of survival.

The most significant impact of the specific research projects noted in the description of the proposal will be the proliferation of knowledge

that will be the basis for further refinement of resource management practices. Some studies such as location of ecosystem boundaries have parkwide effects, and others, such as research on life histories of endangered birds and plants, affect only a single species in or on portions of the park environment. All will have ramifications reaching far beyond park boundaries.

The effect of historic and archeological research is largely cultural. This will improve the accuracy and effectiveness of park interpretive programs. But its impact will also reach far beyond park boundaries and interpretive programs. Greater knowledge about Hawaii's past will be of great cultural benefit to Hawaiians and add to the accumulation of knowledge about the varied and interesting mosaic of cultures that are part of heritage of the United States. Moreover, additional knowledge on location and importance of historic and archeological features will give valuable guidance in location of new park facilities to help insure that no sites are unnecessarily disturbed by construction.

The impact of the U.S. Geological Survey volcanic research program on the environment is more direct, as specific installations are located throughout the park. All existing facilities are noted on a map, page 6 of this report. They include a variety of electronic devices for measuring earth tremors, swelling of the volcanic dome, and tides. All are small, and even in the backcountry are not apparent to the visitor unless he is in the immediate vicinity. As noted in the description of the proposal, they disturb less than ten square feet and may be entirely below ground or 5 to 10 feet above. There are also numerous wires on the ground to some installations, particularly in the upper Kau Desert. Future research will likely require some new installations particularly in areas of new volcanic eruptions. The impact of these installations will be very similar to those existing except that as new information on electronics becomes available, there may be less need for ground wires.

One facet of volcanic research merits special mention. Drilling into the hard surfaces of congealed lava lakes will continue to provide information on cooling rates or on special projects associated with the earth's thermal activity. This usually results only in a hole in the surface of the lava a few inches across. The visual disturbance of the drilling rig during the actual operation is the most adverse effect of these actions.

Control Programs

These are specific proposed practices aimed at controlling or removing competing exotic species that are a continuing threat to endemics. Each has its specific impact.

The proposed goat control operation probably has the greatest potential for protection of endemic plants. It also has the greatest impact on

the resource. Goat drives currently necessitate overflights with helicopters and extensive use of horses over much of the park's backcountry; thus, periodically destroying the wilderness atmosphere. Direct shooting, possibly, is a potential safety hazard to backcountry users. Fencing will have the greatest impact on the environment, particularly the backcountry at lower elevations. Hikers in the coastal and Mauna Loa strip areas of the park could encounter up to 5 or more fences during an extensive backcountry trip.

From the standpoint of resources management, the fencing program dissects the park in such a way that the goat control program can be handled on a unit by unit basis. This system will help protect and restore the park environment on this same basis. Moreover, as specific fenced areas are cleared of goats there will be an excellent opportunity for comparative studies of the effectiveness of management practices. And there will be an opportunity to reintroduce native populations in a more controlled environment. Most important is the overall impact of the goat control program on endangered endemic species. Success of the program gives them their best opportunity for survival.

Impact resulting from the pig control program is similar to the goat program except that it is currently less definitive. Since pigs tend to frequent the cool rain forest areas, the species affected by control programs are also different and include tree ferns, aiea, ae hoawa, pelea and native grasses. Further, pigs inflict a different type of damage on native biota. Goats browse and pigs tend to dig into the soil itself for roots. Since details of the future control program are not known at this time, the impact of the specific measures cannot be adequately assessed. Current known methods of shooting and trapping create the same potential safety hazard for visitors. No known hazard to native animals would result from trapping since the only other species affected would also be feral.

Control of other feral animals (i.e., cats, dogs, mongooses) again will improve chances for survival of native species particularly birds such as the nene and dark-rumped petrel.

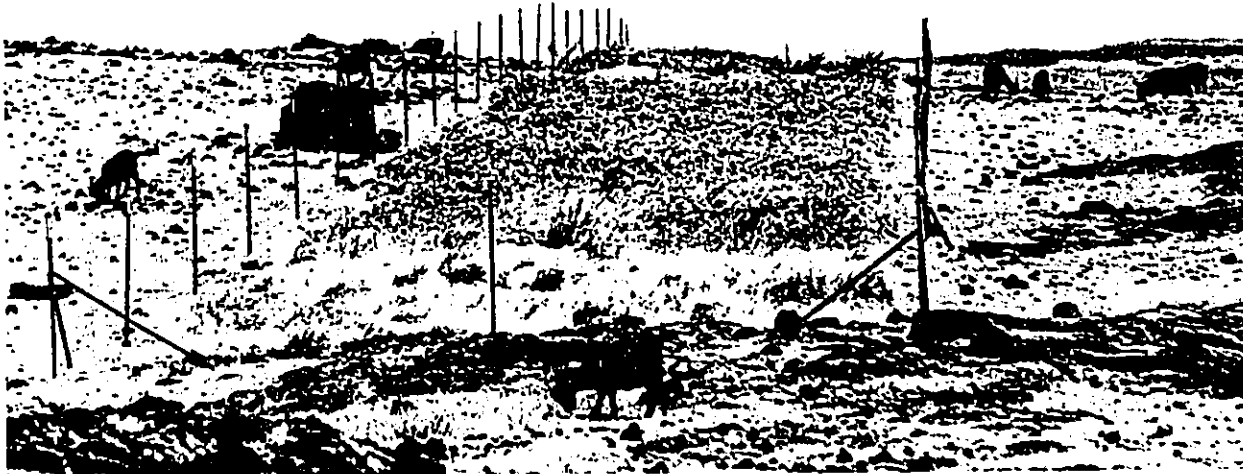
Because the control of exotic plants is proposed for specific areas and limited to particular species its impact will be limited. Roadsides; trails, such as the Devastation and lava tube trails; historic settings; and developed areas will retain, as nearly as possible, an environment of endemic plant species. Particular plants to be removed include blackberry and fayabush. The details and relative success of possible future control programs that reach more of the park's acreage is dependent upon research, therefore impact cannot be adequately assessed at this time.

Olaa Fern Forest is perhaps the most intact ecosystem within the boundaries of the park. The proposal to designate it as a research natural area



Fence surrounding Bird Park. This is the character of the goat control fences proposed in the master plan.

Kukalauula goat enclosure 2 years after construction showing revegetation. Plants include both native and exotic.



will help insure the continuation of its integrity. The only known potential for major change is that introduced by scientific research and by management personnel entering the area. Here there is the ever-present danger of introducing exotic plants by disturbance of the soil and transportation of seeds on clothing. Visitors will be allowed only in the small detached portion of the forest in the southwest corner. Thus designation as a research natural area will deprive visitors of a wilderness experience in the main forest.

A more detailed discussion of research and management programs will be included in the resources management plan and its accompanying impact statement. These are currently being prepared.

VISITOR FACILITIES

The use pattern at Hawaii Volcanoes will change little as a result of the master plan proposals, therefore, there will be little impact on the environment, except for construction of one new access road and replacement of the Chain of Craters Road. Impact that will occur can be divided into two categories: that resulting from a change in visitor desire trends and that resulting from the few physical changes proposed in the plan.

As a greater percentage of visitors come to the park in rental cars, the impact on resources is altered. This is not so much a direct result of this master plan proposal as it is an outgrowth of increased interest in park resources stimulated by educational efforts throughout the system. This will manifest itself in two ways. More cars will create more pollution per visitor than would be created by the same number arriving by tour bus. Second, and more important, these are more adventurous visitors who engage in a greater variety of activities, spend more time in the park, and create a greater impact on the environment. Specifically, there is more trampling of vegetation, more chance of disturbance of the bird population, and because of the less structured visit, greater costs to park management as compared to the tour visitor. The master plan proposals encourage this more intimate resource contact, and thus more latitude for use.

Each of the three zones that provide for this greater latitude has its own particular impact in accordance with the facilities necessary to serve the particular experience desired.

The Primary Use Zone and its facilities will encourage the heaviest use and thus the greatest resource impact. The only major new facility, the Chain of Craters Road, will disturb about 50 to 75 acres of land, and about 50 percent of this could be returned to natural condition. Included in this same project will be the necessary parking areas, overlooks, and interpretive facilities. There are no known historic features to be affected by road construction, but a site survey will be completed to identify any such resources before construction begins. Moreover, more than one-half the road would be constructed over fresh lava flows where there would be no historic values and where little or no regeneration of plant material will have yet taken place. The

RECEIVED AS FOLLOWS

Olaa Forest--The bulk of this ecosystem is proposed as a research natural area to protect it from invasion by exotics.



impact on visitation resulting from this road re-connection will be a greater latitude and variety of use. The visitor will be able to go from the 7,000-foot elevation of the Mauna Loa strip to the coast, experiencing many changes in climate and biota, dramatic examples of recent volcanic activity, and a variety of historic and archeological features.

Changes in the facilities in the Kilauea area will be largely minor changes in road alignment and circulation and construction or relocation of trails. There will be some impact resulting from the use of a shuttle bus, mainly an increase in flexibility for handling large numbers of visitors during eruptions. Such activity can occur far from existing parking areas. The shuttle bus offers a method of visitor transportation that does not require new parking areas for each new eruption, and therefore reduces impact from the changing visitor-use pattern that is unique to Hawaii Volcanoes. Other proposals that effect the environment will be covered in the development concept plan and impact statement to be prepared later.

Construction of a new visitor center on the caldera rim at Uwekahuna will include building, parking, and utilities. This will disturb a maximum of 10 acres, for paving, utility lines, and building construction itself. Over half of this area can be returned to natural conditions after construction is completed.

Preservation and restoration of historic structures along the Kalapana coast will require some disturbance of the sites themselves, particularly those involving ruins stabilization. This type of operation carries with it the possibility of destruction of associated historic features, especially those not yet excavated. In this same area the expansion of campgrounds is expected to affect about 3 to 5 acres of land for roads, walks, utilities and comfort stations.

The master plan proposal does not specify the exact nature of the expansion of the water collection system for Kilauea's development. It is expected, however, that it will remain within or near the confines of the existing collection area. Generally, it will involve covering additional land with a rainshed. Details will be spelled out in the development concept plan and accompanying impact statement.

The Wilderness Threshold Zone contains one major new facility, the access road from State Route 11 to the base of Hualalai's summit, all within the area to be added to the park boundary.

Here, the impact on the land is direct and will remove a maximum of 100 acres of what is mainly native plant cover. The land thus disturbed will provide that area necessary for roads, parking, overlooks, campground, picnic area, and management facilities. Some of the impact will be within

a fragile Hawaiian ecosystem, Kahuluu Forest. Use of this new park land, encouraged by the construction of an access road, will increase the danger of introduction of exotic species on this heretofore inaccessible resource. And the near wilderness atmosphere that now exists will be diminished by more intensive use, mainly within the 100 acres disturbed by construction and, to a lesser degree, in the immediately surrounding roadless area, including the summit of Hualalai. The latter area also contains several species of rare plants such as sandalwood. Perhaps even more important is the proximity of nesting areas for nene and Hawaiian Crow.

There will also be some impact on lands adjacent to the proposed road. Provision of access to this heretofore roadless area will stimulate uses such as residential development and agricultural use. The extent of this impact is unknown at this time and will depend to a great degree on local zoning controls.

Threshold zones in the existing park are proposed to remain at their present state of development, except for minor road improvement and campground development in the Ainahou vicinity. Impact of the minor road improvement and campground will be covered in greater detail in the development concept plan and impact statement. The extent of impact, however, will involve a maximum of 15 to 20 acres adjacent to the road and 5 acres for campground development. More than half of this is within the recently purchased Ainahou Ranch, an area that has sustained grazing activity for many years.

Information provided to the visitor about wilderness threshold areas will stimulate increased use, and this will probably have the greatest impact. Additional compaction of soil, trampling of vegetation, and increased fire danger will result. Moreover, management costs will rise as more visitors move into seldom visited sites.

The Backcountry Zone will be able to sustain considerable additional use and under more desirable conditions. New trails, backcountry shelters and expanded interpretation will encourage and facilitate use of this largest portion of the park. The coastal area, now difficult to use because of lack of water, will in the future have conveniently located minimal shelters and water supply. Thus, a much greater variety of park experience will be available to more visitors.

The increased use, too, will have its impact. There will be greater pressure on coastal resources, particularly intertidal zones and inshore waters from fishing. The land around the shelters will also receive heavier use and endanger plant materials and any historic sites in the vicinity. As in the case of other concentrated use areas, maintenance and management costs will increase, the precise amount being unknown.

Trails on the Mauna Loa strip will sustain some increased use but with little or no impact on the resource since the land is almost all barren lava. The main impact will be social in that resulting crowded conditions at the Red Hill and Summit Cabins will diminish the visitor's backcountry experience.

Impact from backcountry development will result from construction of new trails and backcountry shelters in the coastal area. Major new trails will be built around the Hualalai summit and a connection across the saddle area to Mauna Loa. The maximum amount of new trails will be about 50 miles. Little or no impact on plant cover will result from construction since nearly all trails will pass over barren lava, cinder fields or sparsely vegetated areas.

New backcountry shelters will disturb not more than 1 to 3 acres for construction. Their major impact will be visual--a formal structure along an undeveloped coastline.

CULTURAL INTEGRITY

For many centuries prior to introduction of European culture to Hawaii, a complex native culture flourished in the area now designated as Hawaii Volcanoes National Park. And even though no Hawaiians now live on these lands, many cultural remnants remain, particularly along the coast.

As a result of new facilities and the increased visitation thus encouraged, there will be increasing impact on Hawaiian culture as a whole and specifically on those cultural sites in the park that the visitor is invited to see and appreciate. Unless interpretation and use of cultural resources are sensitively handled, there is danger of adverse cultural impact. These are predominantly intangible but have the overall effect of presenting a distorted or superficial picture of early Hawaiians, a loss of cultural integrity, and a lessening of the dignity inherent in this very important aspect of present day Hawaiian life and an integral part of the Nation's heritage.

MITIGATING MEASURES INCLUDED IN THE PROPOSED ACTION

Many of the adverse impacts resulting from the master plan proposals can be tied directly to increased visitor-use pressure on park land. Others are a physical change in the face of the land as a result of new development. Each of these can be mitigated to some degree by more intensive management, interpretation, and special care in the more detailed planning that follows the master plan.

Specifically, interpretation and orientation can instill in the visitor an understanding of the unique character of the insular Hawaiian environment, the dangers of its general deterioration, and particular species of plants and birds that are in danger of becoming extinct. Further, increased management and research staff can discover new methods of control that will help mitigate the effect of increased use.

Perhaps most important of all is the recognition that the number of visitors the resource can accommodate without unacceptable damage is finite and the setting of capacities, even interim ones, will provide a measure for the amount and extent of damage resulting from visitor use. Further research will act as a monitor to determine if and when capacities should be raised or lowered. Therefore, the capacities indicated in the following table should be considered as a point of beginning.

Sec. of the Park	Controlling Factors	Duration of Stay	Number at One Time	Persons Per Hour	Daily Carrying Capacity	Hours of Use
Halemaumau Overlook	Safety	30 min.	250	500	5,000	10*
Uwekahuna Overlook	Safety	30 min.	250	500	5,000	10*
Thurston Lava Tube	Ecol. Impact Park exp.	20 min.	100	300	3,000	10
Devastation Trail	Park exp.	30 min.	100	200	2,000	10
Bird Park	Ecol. Impact	1 hour	100	100	1,000	10
Wahaula Heiau	Park exp.	30 min.	100	200	2,000	10

Sec. of the Park	Controlling Factors	Duration of Stay	Number at One Time	Persons Per Hour	Daily Carrying Capacity	Hours of Use
Chain of Craters Overlooks	Safety	1 hour	200	200	2,000	10*
Kamoamoa	Park exp.	1 hour	200	200	2,000	10
Backcountry coastal	Facilities	day or more	200- 300	N.A.	200- 300	24

*Except during eruption periods.

As indicated in the chart, separate groups of visitors can view and utilize the farflung park resources at the same time. Almost all, however, will seek the Kilauea Caldera area sometime during their visit. Therefore, the carrying capacity for the park can be based on the number of persons that the Caldera's overlooks and trails can handle during a visitor day (approximately 10,000). During heavy eruption periods, however, this capacity will probably be greatly exceeded by special control measures that can route traffic to other special view points. Crowds up to 20,000 per day have been handled in the park during major eruptions.

Fragile resources such as Kipuka Puauulu, Thurston Lava Tube, and Olaa Forest should have a more specific limitation, since overcrowding would drive out the bird population or trample irreplaceable native plants.

Preliminary steps have been taken to initiate a 106 action in compliance with the Historic Preservation Act of 1966. It notifies the Advisory Council on Historic Preservation and the Hawaii State Historic Preservation Officer, that as a result of actions proposed in the master plan, there will be some effect on cultural sites within the park.

BOUNDARIES AND LAND ACQUISITION

With the deletion of Tracts 19 and 20 on the east boundary of the park, the resultant increasing encroachment of exotic plants will be a danger to rare plant communities on adjacent park lands. As these competing species threaten the integrity of park resources, they will be physically removed when possible.

Continuing liaison with the State of Hawaii will help mitigate the multiple management impact resulting from Federal ownership of the offshore waters.

A proposed road alignment study for the Hualalai access road will be effective in minimizing the impact on agricultural lands and on the number of residents that will need to be moved. This will be accomplished by detailed surveys and study of alternative rights-of-way to find the one most appropriate for convenience and minimum impact on local land use.

RESEARCH AND MANAGEMENT

U.S. Geological Survey installations will continue to be a fact of life in Hawaii Volcanoes. Continued liaison between that agency and the National Park Service will minimize the adverse affect of new installations by their location away from areas of concentrated visitor use. Moreover, providing information to the visitor on the purpose and importance of this program will minimize damage to those located where they may be easily encountered or seen by visitors.

The resource classification map (page 10 of this statement) identified those features within the park that are important to protect. Continuing reanalysis and reference to this data helps to mitigate damage that could occur through overuse or location of facilities on historic sites or fragile natural areas. A study, now underway, will seek to refine information on historic and archeological sites and identify those that should be included on the national register. This along with other research on flora and fauna will augment the resource data presently available and point out areas where development and use could cause adverse impact.

The problem of goat fences, another fact of life to be recognized and an inconvenience to backcountry visitors, can be mitigated by locating trails where fewer fences will be encountered by backcountry users and by construction of a style or other means to climb over the fence.

Direct shooting of goats and pigs and trapping of these and other feral animals can be done in light use backcountry areas and by scheduling to avoid heavy use periods.

Even though there will be no provision for the visitor to see the bulk of Olaa Forest, other similar areas will continue to be available to him. The popular Thurston Lava Tube Trail is largely through a mixed fern-ohia forest. And a proposed trail will lead the visitor through a sample of the Olaa Forest on the small detached section. Finally, photographs and interpretation can expand the visitors' knowledge and understanding of this unique ecosystem with no physical impact of use on the land.

DEVELOPMENT

Much of the relocated Chain of Craters Road will pass over land recently covered with lava flows. In other areas, however, it will be necessary to study alternative routes and choose one that provides a scenic drive with good overlook sites and avoids concentrations of important endemic plant communities. Also, in accordance with Executive Order 11593, concerning preservation of cultural features, a site survey of the alignment will be completed before construction begins. If historic or archeological values exist, the road alignment will be altered.

As visitation increases both day and overnight use, so will demand for water in the Kilauea area, and so will the demand for a larger collection system. To minimize impact from this expansion, the master plan proposes to maintain overnight facilities at their current level. Moreover, one of the considerations for setting final park capacities will be the amount of water required and the impact on the environment resulting from its development.

The proposed Hualalai access road will pass through many Hawaiian plant communities as it ascends to the 6,500-foot elevation. Particularly significant is the Kahului Forest between 2,000 and 3,500 feet, an excellent example of Hawaiian rain forest. The road will be located at the edge of the forest or some other location to best protect the integrity of this resource. Impact on other important endemic plants such as might exist near the road terminus and its development will be minimized by a survey of the sites to determine the type and extent of these endemic populations. Such a survey will also include consideration for the native bird habitat. Preliminary studies have been conducted as a part of the preparation of this impact statement.

The current atmosphere on Hualalai is one of wilderness or near wilderness. Retaining a low-key development and low-standard access road will preserve much of this atmosphere, as will the location of development at the edge of rather than the center of this park addition.

In the small portion of Olaa Forest proposed to be open to public use, the danger of resource damage in this native environment will be mitigated to a great degree by construction of an elevated trail, which will minimize physical contact between the visitor and the resource.

As hiking use on the coastal region increases, so will fishing use. Impact on fragile intertidal and offshore marine values can be partially mitigated by setting capacities for use and limiting the amount of fish and shellfish harvested. This will require additional management personnel and cooperation with the State Fish and Game Department.

Closely associated with this will be the impact of use around back-country shelters. Here again, capacities and their enforcement will be the best control to mitigate resource damage that results from the concentration of visitors at these sites.

Concerning the possible adverse impact on Hawaiian culture, the most effective mitigating measure will be continued and increasing liaison with local Hawaiian citizen groups. There are several of these organizations in existence and they are especially interested in maintaining many Hawaiian traditions concerning the arts and the manner in which land and resources are used. Consultation with these groups will be invaluable in increasing the effectiveness of interpretation in culturally sensitive areas, deepening the visitor's awareness of Hawaii's past, and in maintaining Hawaii's attractive environment both in and outside the park.

In compliance with Section 106 of the National Historic Preservation Act of 1966, Procedures for Compliance with Section 106, item B (2), the National Register of Historic Places as published in the Federal Register of February 28, 1973, along with supplements through July 30, 1973, have been consulted. No National Register properties are located within Hawaii Volcanoes National Park at this time.

In compliance with Executive Order 11593, May 13, 1971, Section 2, Responsibilities of Federal Agencies, an archeological and historical survey to locate, inventory and nominate to the National Register of Historic Places, all sites of archeological and historical significance which appear to qualify for listing is underway.

In compliance with Section 2 (b) of Executive Order 11593, the National Park Service, Western Region, is exercising caution until inventories and evaluations are completed to insure that Federal property is not transferred, sold, demolished or substantially altered. The Master Plan for Hawaii Volcanoes National Park does not propose to transfer, sell, demolish or substantially alter sites of archeological or historical significance.

Comments on the master plan have been requested from the Hawaii State Historic Preservation Officer and have not yet been received. His comments will be incorporated in the final environmental statement.

ADVERSE EFFECTS WHICH CANNOT BE AVOIDED
SHOULD THE PROPOSAL BE IMPLEMENTED

Regardless of the mitigating measures discussed previously, there will be some adverse impacts resulting from the implementation of the master plan proposals. As use increases and facilities expand to accommodate it, there will be added impact on resources as more visitors utilize trails and trample vegetation. Further, more cars will increase the possibility of air pollution and the total cost of park management will increase. The latter is particularly significant. Added visitation and development increases management problems, but even more important, the addition of Hualalai's summit and the saddle area will probably double the cost and extent of the resources management program, assuming the planning concepts are adhered to. There are general impacts that involve the park as an entity. Others apply to specific proposals.

BOUNDARIES AND LAND ACQUISITION

Even with the special care taken to protect endemic plant populations along the park's boundary, the deletion of tracts 19 and 20, and their probable development for residential use, will always have exotic plant species that may spread onto nearby park land.

Inclusion of tract 22, a mixed ohia-fern forest will remove this land from possible use for residential use or for consumptive uses such as harvesting fern logs.

The Hualalai addition and proposed access right-of-way will remove land from potential agricultural use. While most of this use is considered marginal or sub-marginal, the impact is nonetheless real. At lower elevations, the right-of-way acquisition will remove a maximum of two acres from coffee production and, depending on alignment, some residences. On the upper right-of-way land and Hualalai grazing will be precluded.

MANAGEMENT AND RESEARCH

As new eruptions occur, future research projects by the U.S. Geological Survey will continue to include new locations for seismometers, geodimeters, drill holes, and tilt stations. Specific impact is discussed in this report under Environmental Impact of the Proposed Action.

The park's research and management programs will also have their impact. Goat fences will remain as a significant impact in the back-country, and as long as direct shooting is used as a control measure, there will be a potential visitor safety problem, however slight.

Keeping Olaa Fern Forest in a pristine state means no visitor use and this will deprive the public of the opportunity to see and enjoy this unique ecosystem by experiencing it first hand.

DEVELOPMENT

All new facilities proposed to serve increased visitation will have their adverse impact, not only from construction but also from the increased visitation thus stimulated. The new Chain of Craters road, visitor center, water collection system, Hualalai access road, and expanded campgrounds encroach upon resource values and increase the possibility of diminishing endemic populations. This is particularly true for Hualalai and its access road where the change in land use is most profound. Specific examples are the Kahuluu Forest where any change is a new threat to the Hawaiian ecosystem and the Hualalai summit area which is particularly important habitat for native bird species.

Finally, the backcountry shelters, particularly in the coastal area, will produce an impact on the backcountry that can only be partially mitigated. These will always be a magnet for hikers as they will be the only available sources of fresh water. Moreover, coastal and marine resources in the vicinity will receive more use and, therefore, the potential for damage remains.

There are limited resources in the park's forested areas that could be harvested. The dense rainforests, about 20,000 to 25,000 acres, contain a predominant native cover of ohia and ferns with an occasional Koa, also native to Hawaii. Koa is coming back along the Mauna Loa Strip where the potential is for about 4,000 acres of open stands of Koa forest in the future. Koa has been used for finished wood and novelty items. Ohia wood is used in somewhat the same manner and it is the most common tree in the islands. Fern logs, as previously mentioned, are used for carving kihis (Hawaiian idols) and an adequate supply is thus far available on other parts of the island.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES
OF MAN'S ENVIRONMENT AND THE MAINTENANCE
AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The greatest benefits to be derived from an adequately managed Hawaii Volcanoes National Park are scientific and cultural in that if these disappearing endemic plant and animal communities plus the remains of early Hawaiian occupation can maintain even a semblance of their original integrity, the information thus available can help indicate how other portions of man's environment can be similarly maintained. This is especially significant in Hawaii because of the vulnerable nature of these ecosystems--complex insular biotic communities that developed somewhat independently of continental lifeforms but sensitive to competition from those same lifeforms. Similarly, a continuing study of the early Hawaiian's life patterns, and the manner in which they used the land, can be helpful in determining how man will use his environment in the future.

If these resources can be maintained, the inspirational and educational opportunities for the public are legion. The dramatic displays of volcanism and their myriad opportunities for interpretation and research will continue despite man's operations. Many of the native birds and some rare plants, however, simply will not continue to exist without some positive management program that seeks to protect them.

Park resources available for direct economic benefit are few. There are no known mineral resources, and the rough coastline with its frequent strong wind is essentially unsuitable for resort development or even for an economic agricultural operation.

Roads, trails, buildings, and other developments designed to make the park accessible constitute a commitment to visitor convenience. This, however, should not overshadow the productivity of the park as an outstanding scientific, educational and recreational resource and one that needs certain man-made improvements to maintain it, interpret it, and further utilize it in order to realize these long-term gains.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES
WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION

The proposals in the master plan result in few irrevocable uses of resources except where new park facilities are proposed. New roads, buildings and campgrounds will disturb the native plant cover and, with the prevalence of exotic species, the possibility of returning the land to its original condition is remote. Most proposals, however, will in fact help to insure preservation of the environment. This includes research, resource management, and control of visitor-use patterns. There is, however, no commitment of nonrenewable resources such as archeological or historical sites, rare plant communities, animal habitats, or minerals.

Those lands proposed for acquisition would be permanently unavailable for development for strictly economic benefit. And this is an irreversible commitment of resources unless Congress determined it desirable to reverse its earlier action and make all or part of the park available for private investment.

ALTERNATIVES TO THE PROPOSED ACTION

During the master plan study, numerous alternatives were investigated and analyzed, relative to all aspects of the master plan proposal-- boundaries, resources management, development, and special land-use problems unique to Hawaii Volcanoes. The following discussion deals with these alternatives as separate subjects.

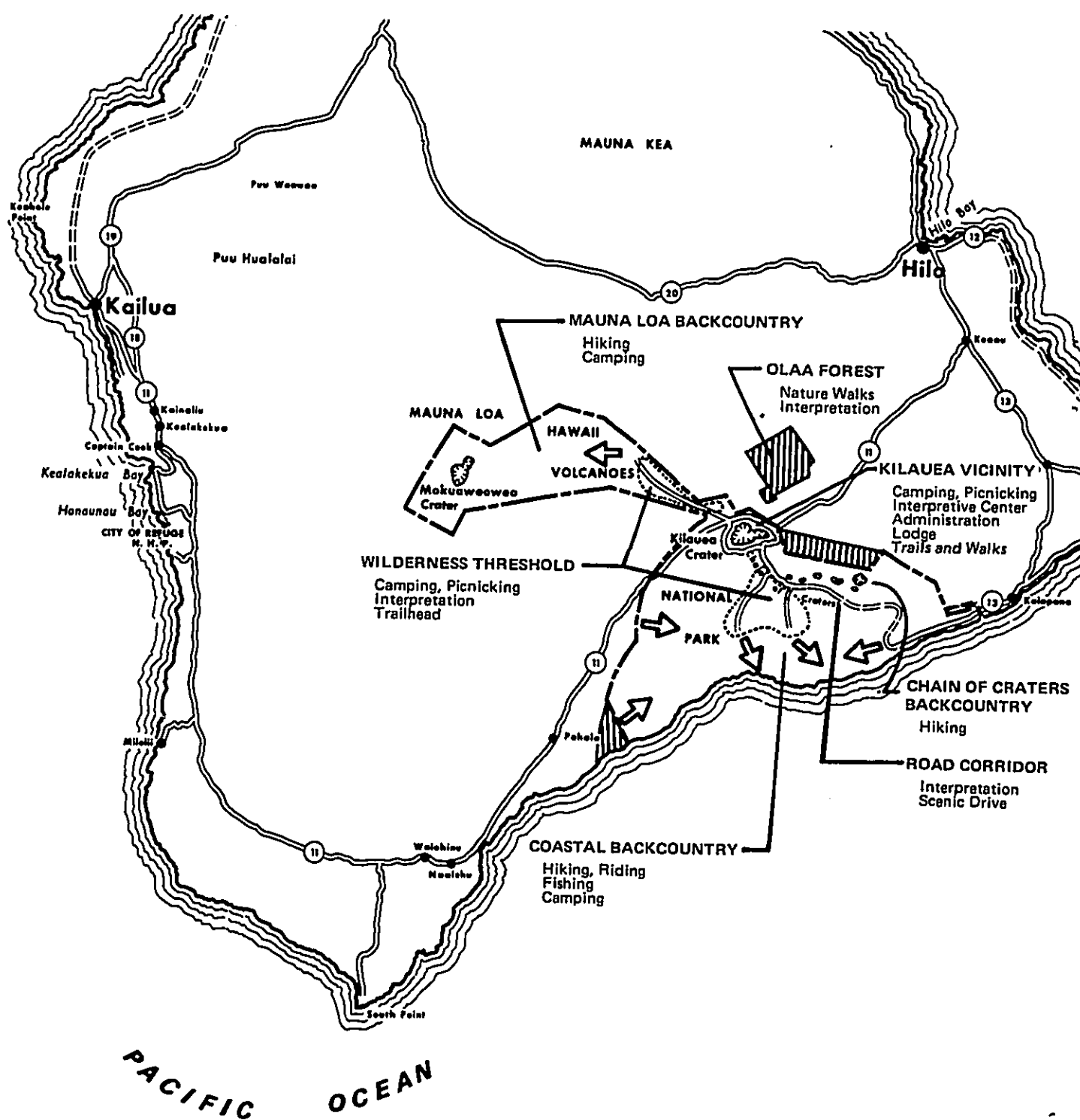
ALTERNATIVE A - NO EXPANSION OF AUTHORIZED BOUNDARIES

Park Boundaries: Add the authorized land on the Hilo side of the Chain of Craters (approximately 5,800 acres), Olaa Forest (approximately 9,600 acres), land southwest of Kapao Point (approximately 2,000 acres), and a strip of land mauka of the Kalapana Road (approximately 520 acres). Delete the intervening land between Olaa Forest Tract and Kilauea (approximately 1,400 acres), and land mauka of the above-mentioned Kalapana addition (approximately 2,975 acres).

Development and Use: Present use patterns would continue, with little change. The Chain of Craters Road could be reconstructed, with changes in location prompted by the recent volcanic activity. Day use would continue to predominate, but there could be some additional provision for overnight camping. The only new area opened up for public use would be a portion of Olaa Forest. Overnight lodge facilities would remain at their present level, but new facilities could be encouraged in gateway areas such as Punaluu, Volcano, Hilo, and Kalapana.

Impact: This is essentially a status quo plan. Existing management and interpretive programs would continue. Thus, that acreage of land now within the National Park would be protected from development that could disturb or destroy Hawaiian ecosystems and important cultural sites. Only these lands already authorized for acquisition would be acquired. This would bring additional Hawaiian upland forests (over 15,000 acres containing rapidly disappearing ecosystems) under permanent protection.

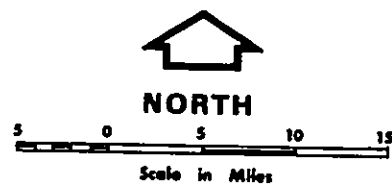
The deterioration of native flora and fauna on land adjacent to the park would likely continue, probably at an increasing rate, because of the presence of uncontrolled populations of feral goats, sheep, rats, and pigs, as well as exotic plant species. Much of the land would likely be open to recreational hunting on a special permit basis. As little of the surrounding high elevation land is suitable for resort use, subdivision or even concentrated agricultural use, no major change in land use would be expected. The exception to this is the coastal land at Kalapana and between Pahala and Naalehu where there could be some resort development. Moreover, there are no known major historic sites on these lands except for Ahuaumi Heiau and the Judd Trail (in the saddle between Hualalai and Mauna Loa).



ALTERNATIVE A HAWAII VOLCANOES NATIONAL PARK

LEGEND

- EXISTING PARK LAND
- AUTHORIZED PARK LANDS TO BE ADDED
- MAJOR ACCESS TO BACKCOUNTRY



Management and development costs would be the least of all alternatives since no new major resources would be added to the park. This is especially significant considering the continuing costs of protection of native populations and the programs to reintroduce certain species that are in danger of extinction, \$170,000 in fiscal year 1973 and \$275,000 programmed for 1974. Addition of presently authorized rain forest lands do add new acreage to be managed but cost increases would be negligible. Olaa Forest is already managed by the park, and the land east of the Chain of Craters does not add any new type of forest or change the basic dimension of the management program. Land to be acquired at the southwest corner of the park contains resources very similar to adjacent park land so no appreciable new management costs would be incurred here.

Deletion of the authorized land, as mentioned above, would simply remove them from consideration for acquisition. Since there is considerable residential and agricultural development currently underway, non-acquisition would incur no loss of inherent resources here. The only known impact on park land would be as a result of increased introduction of exotic plants and animals directly adjacent to the park. And this would be identical to any portion of the park boundary.

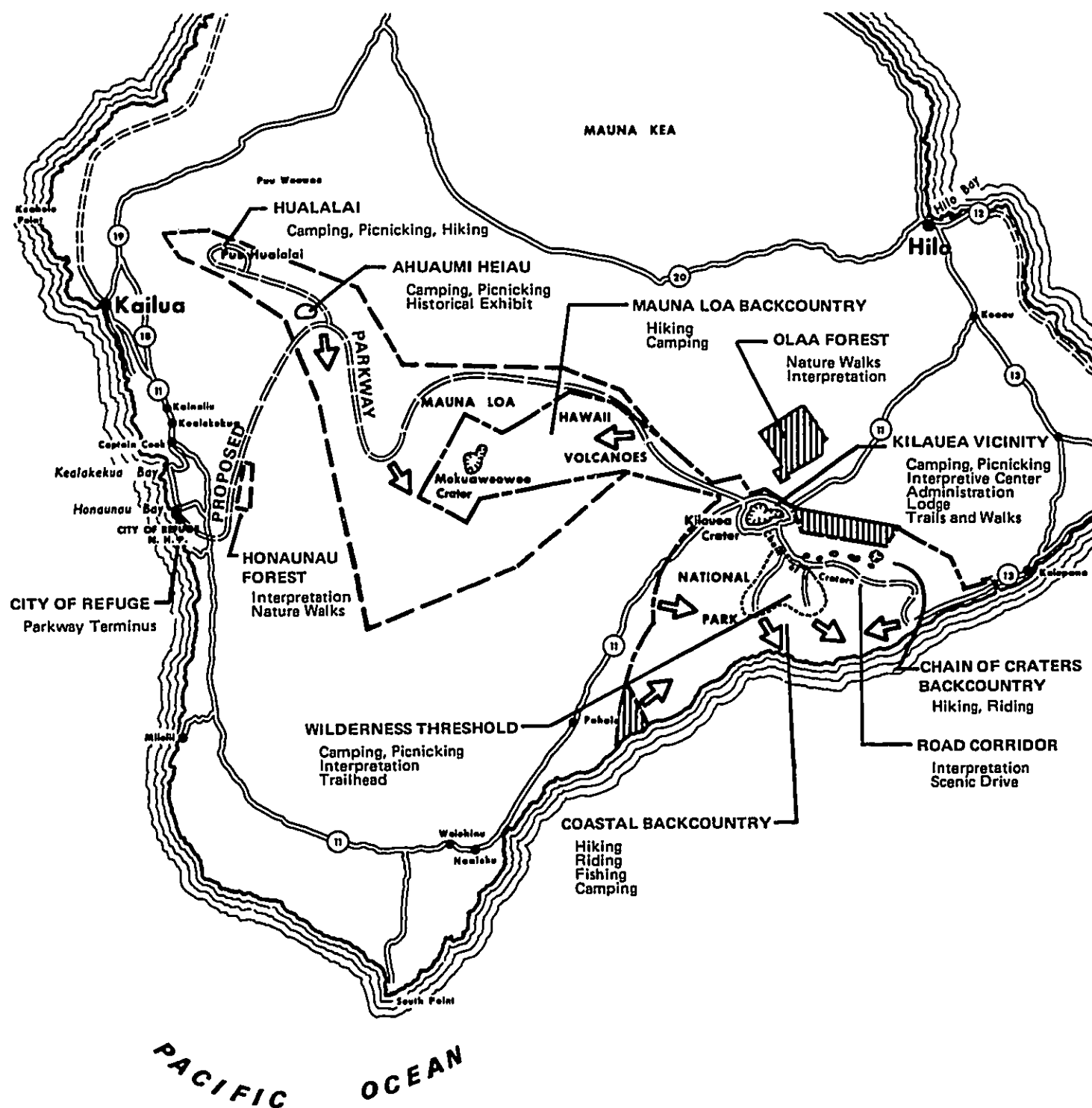
ALTERNATIVE B - JUNE 1970 MASTER PLAN PROPOSAL

Boundaries: Addition and deletion of authorized land as in Alternative A. Authorize addition of the Summit of Hualalai, the saddle area between Hualalai and Mauna Loa, Southwest rift zone of Mauna Loa down to about the 8,500-foot elevation, 5,000 acres of Honaunau Forest, such land as needed for scenic road right-of-way, and offshore lands to 1/4 mile from high tide. The total acreage to be authorized is about 193,000 acres of land and 5,400 acres of water.

Development and Use: For the existing park lands, the use and development pattern would remain the same as in Alternative A. For those lands to be added, a scenic parkway would be constructed to connect Kilauea, the north flank of Mauna Loa, the saddle area, Honaunau Forest and City of Refuge. There would also be a spur road to the vicinity of the Hualalai summit. Other facilities to be developed in connection with the parkway would include scenic overlooks, about 50 miles of new trails, campgrounds (50 sites maximum), picnic areas and interpretive facilities dealing with the geology of Mauna Loa and Hualalai, historic features, plus the unique native plant and animal communities on Hualalai and in Honaunau Forest.

The latter is located on the leeward side of Mauna Loa and is a part of the main watershed for the coastal areas of Kealahou and Honaunau on the Kona Coast. Since it is a part of the only rain forest on the leeward side of the Hawaiian volcanoes and has suffered the least from intrusion by exotics, it is of major ecological significance. This particular section starts at 2,200 feet in elevation and rises to 4,750 feet. It has an area of about 10,500 acres in a somewhat rectangular shape of 3 1/2 by 5 1/2 miles. Preliminary examination of the forest indicates that the greater part is still intact, and except where roads, trails, and clearings have been made, the native species still dominate. Rare plant species include various species of *Bidens*, *Santalum pilgeri* and/or *paniculatum*, *Cyanea carlsonii*, *Delissea undulata*, Hawaiian strawberry, and Hawaiian rubber tree. Small numbers of the Hawaiian crow have also been reported in the Honaunau Forest and on Hualalai in recent years. They are among the very last in existence and are on the United States Department of Interior list of endangered species.

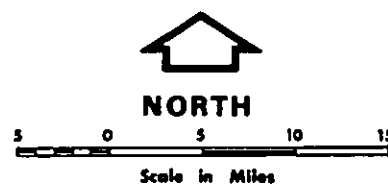
The dominant feature of this alternative is the scenic road or parkway, 90 miles long, that would provide opportunity to drive from the Kalapana Coast to the 9,000-foot level of Mauna Loa and back to the Kona Coast all within federally owned land. The only major historic features added would be Ahuaumi Heiau and a portion of the Judd Trail.



ALTERNATIVE B HAWAII VOLCANOES NATIONAL PARK

LEGEND

- EXISTING PARK LAND
- AUTHORIZED PARK LANDS TO BE ADDED
- MAJOR ACCESS TO BACKCOUNTRY
- PROPOSED PARK ADDITIONS



Management programs aimed at protection of rare species such as the Nene goose and other native bird species, sandalwood, and rain forest ecosystems would be greatly expanded beyond the existing programs, both in scope and amount.

Impact: The greatest impact would be that nearly 200,000 acres of new land would be placed under national park management--land unlikely to be afforded any similar protection under any State or local program, given the competing priorities and great costs involved. The impact of the proposed parkway is also considerable since it would entail approximately 70 miles of new road over country that is now essentially de facto wilderness. Approximately 300 to 400 acres of land would be disturbed by construction, although 15 to 20 miles of this would be on bare lava or adjacent to and not through native Hawaiian ecosystems. Also, this acreage would include those lands disturbed by construction of roads, walks, buildings, and utilities in connection with development in the Hualalai Saddle. No specific location for these developments has been determined, but it is anticipated that sites can be selected that would avoid disturbance of rare and endangered native populations.

Costs of management and development would be greatly increased. New road construction would likely be over 10 million dollars and management costs would probably double over those in the existing park. Particularly important is the already recognized problem of maintaining native populations within the existing park. Although there is measurable improvement in the park environment, the success of these programs is only partially known at this time, and the resource management problems entailed with nearly doubling the park's acreage are legion.

Moreover, much of the new road construction would be on the upper shoulder of Mauna Loa. Although this major volcano has not erupted since 1950, the previous pattern indicates some eruption activity every two years. Thus, 15 to 20 miles of the new road would be subject to occasional, if not frequent, inundation by lava flows similar to that recently experienced on the existing Chain of Craters Road. This would mean temporary curtailment of parkway use until a new section of the road could be constructed.

Concerning the impact on the island's economy, alternative uses of the land involved are few. Most are at high elevations offering little opportunity for the usual investment in resort uses or agriculture. Even past attempts at creating a commercial timber resource have been largely unsuccessful.

The tourist industry would be provided with an alternative route between Hilo and Kona as a result of parkway construction. Tours now

follow the existing State Route 11 around the south end of the island. Travel time on the new road would be longer, about 2 1/2 to 3 hours, but would afford much greater variation in land forms and biological communities than now exists. Total capacity for numbers of visitors would not be increased greatly because the same controls would still exist as now, namely the capacity of facilities such as the Chain of Craters Road and the developments at Kilauea. Overnight camping use would probably be doubled over what it is now with the addition of campgrounds around Hualalai. Backcountry use could also be increased by at least 50% with the addition of the new acreage and provision of trails in the Mauna Loa-Hualalai vicinity.

ALTERNATIVE C - ADD HUALALAI AND SADDLE AREA WITH MINIMUM DEVELOPMENT

Boundaries: Addition and deletion of authorized land as in Alternative A. Authorize addition of the summit of Hualalai, the saddle area between Hualalai and Mauna Loa, and minimum land surrounding the summit of Mauna Loa. The total acreage thus authorized to be determined by the specific boundary, but could be 120,000 acres or less.

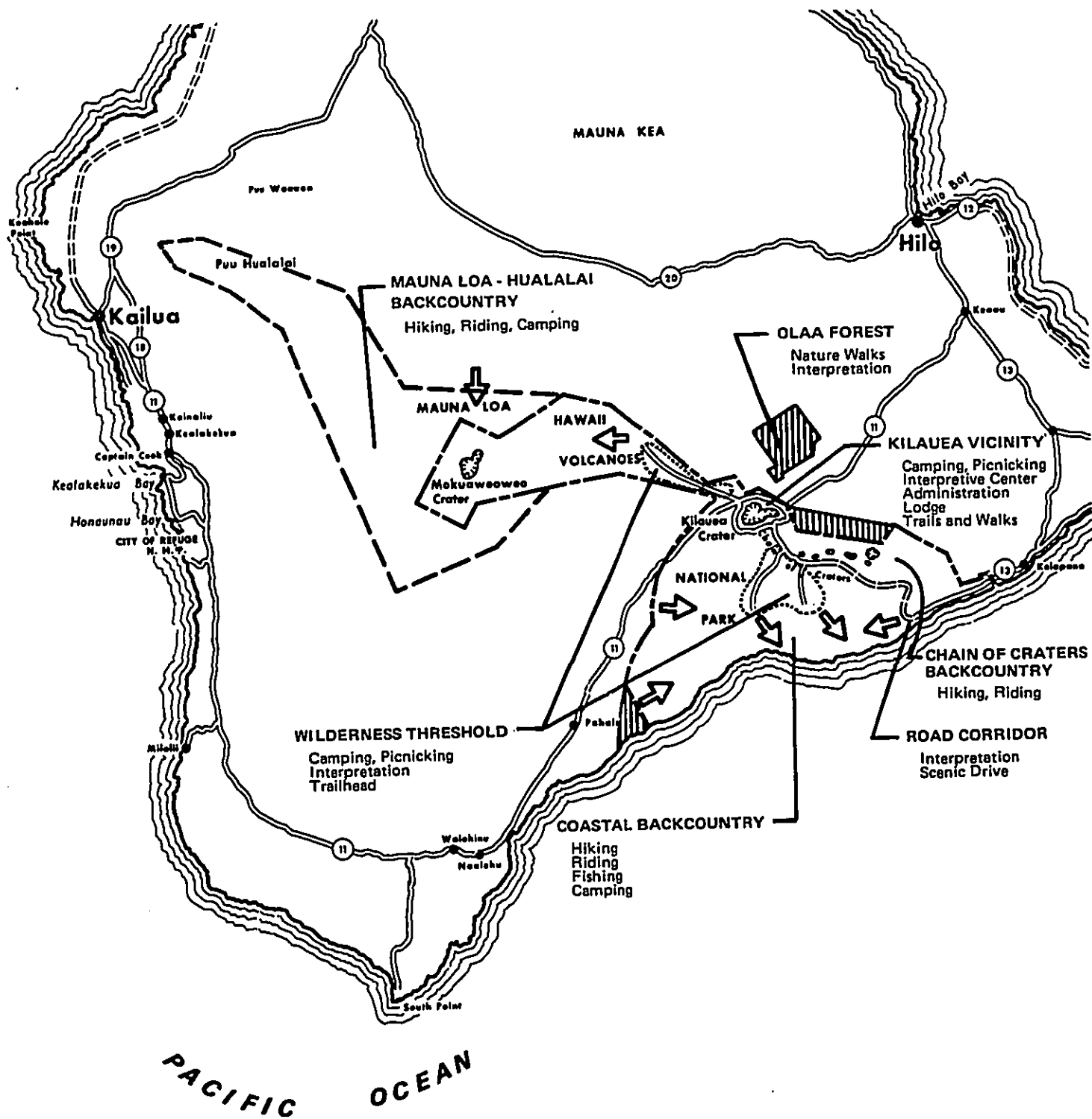
Development and Use: This alternative provides essentially for a scientific preserve for the added lands. The only access would be by trail and the major purpose of the added acreage would be preservation of biologic, geologic and historic features, with minimum development. Visitor uses would include hiking, backcountry camping, and riding. Trail access would be provided to Hualalai, the saddle area, and the summit of Mauna Loa.

Management programs would be similar to Alternatives B and C but would be more difficult since there would be no motorized access.

Impact: This is the purest preservation approach to resources management. The impact on the physical environment would be the least of all the alternatives. Development would consist of new trails, probably 50 miles maximum. Increase in visitor capacity would be minimal, probably less than 10%, because of very difficult access and limited facilities.

Management would direct its efforts toward reintroduction of native populations and control of exotics, resulting in a positive impact on Hawaii's environment, but management costs would be similar to those in Alternative B, due to limited access. This same limited access would give the greatest protection to the rare and endangered species such as the nene goose and Hawaiian crow, as well as the plants unique to that area, such as sandalwood.

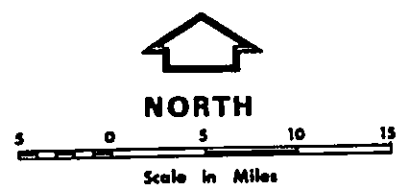
Impact on the Island's economy would be similar to other alternatives, except that here little additional visitation to the park would result, nor would a large amount of development funds be available to stimulate the local economy. Only wages paid to the additional personnel needed for resources management would be added to the economic base.



ALTERNATIVE C HAWAII VOLCANOES NATIONAL PARK

LEGEND

- EXISTING PARK LAND
- AUTHORIZED PARK LANDS TO BE ADDED
- MAJOR ACCESS TO BACKCOUNTRY
- PROPOSED PARK LANDS TO BE ADDED



ALTERNATIVE D - ACQUIRE ALL AUTHORIZED LAND

Boundaries: Acquisition of all lands authorized for addition to the park, including those indicated in Alternative A plus the intervening land between Olaa Forest and Kilauea and land mauka of the Kalapana Road, this would be a total of 23,000 acres to be acquired.

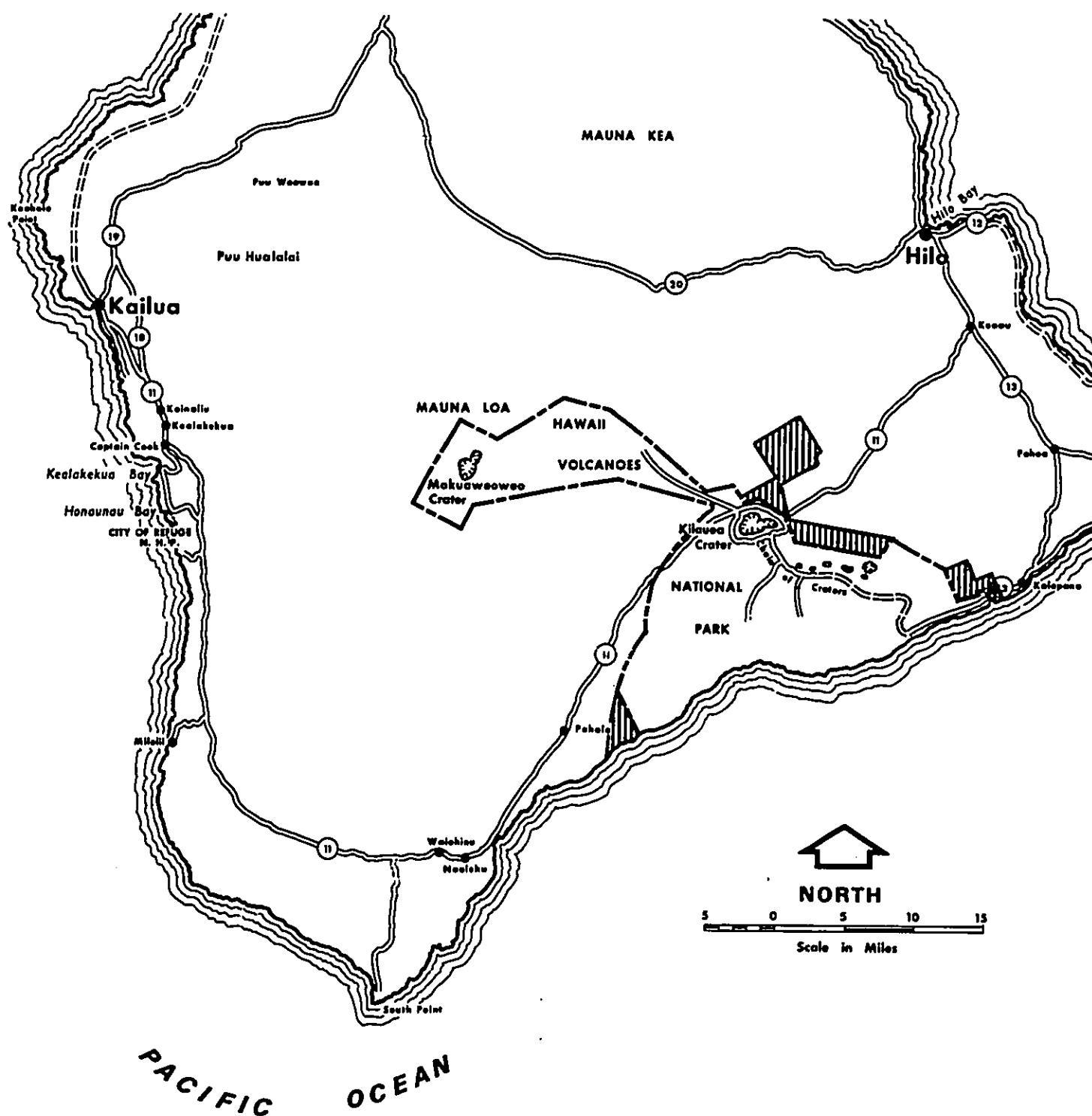
Management and Use: Public use would change little from the current pattern, since no lands of significant resource value would be added except Olaa Forest and the rain forest section east of the Chain of Craters. The only known feasible use of these lands is for development of overnight facilities, particularly since they contain little undisturbed native plant and animal communities.

Management would encounter new and greater problems because the two parcels now proposed for deletion contain considerable residential and agricultural development incompatible with national park status. The possibility of returning such land to something approaching native vegetation is remote, given the current knowledge and techniques.

Impact: This alternative would make Olaa Forest contiguous to the remainder of the park and thus provide a single uninterrupted park unit for management and development. And it would provide a buffer for the Kalapana coastal area and its resources. This is particularly significant along the boundary directly mauka (inland from the Kalapana visitor center where rare plants such as ohe makai, iliahi, hoawa, and ahakea still exist).

Impact on the economy would entail removal of subdivision covering 1,700 acres on the Kalapana parcel and the curtailment of golf course, agricultural, and residential use on about 3/4 of the land between Kilauea and Olaa Forest.

Impact on management and development would vary depending on how the land was used. No information is available on the cost of returning the land to a natural state, even if that were proposed and were feasible. And costs entailed in development would depend on the type of use and facilities proposed. This could vary from campgrounds and picnic sites to a more ambitious hotel or lodge facility. There are also the direct costs entailed in land acquisition. In the Kalapana area, cost of land might vary from \$1,500 to \$3,000 per acre for mauka lands. Lands in the Kilauea area could cost from \$2,500 to \$5,000 per acre.



ALTERNATIVE D HAWAII VOLCANOES NATIONAL PARK

LEGEND

- EXISTING PARK LAND
- ▨ AUTHORIZED LAND

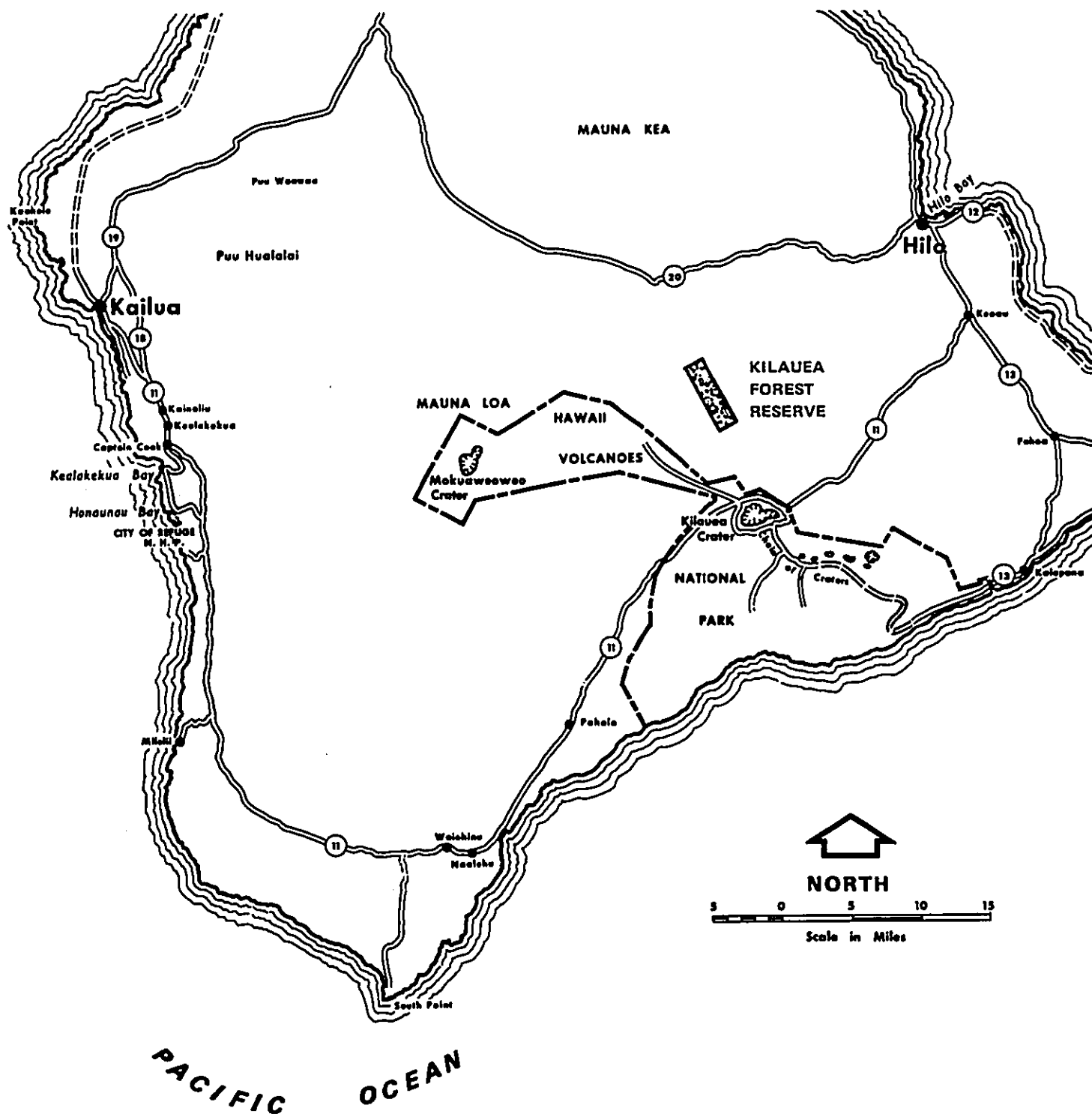
ALTERNATIVE E - ADD SECTIONS OF THE KILAUEA FOREST RESERVE

Boundaries and Resources: Include all or selected parts of Kilauea Forest Reserve, a maximum of 9,000 acres. This is a parcel of native Hawaiian forest of considerable significance, and is the only remaining place in the world that the endangered birds Hawaii akepa, creeper, and akaipoloau, still occur.

Management and Use: Appropriate management would be similar to Olaa Forest. The bulk of the land would become a research natural area with a small sample available for the visitor to walk into as another example of a native Hawaiian ecosystem. Development would be limited to a short trail system (less than one mile), a small parking area (20-30 cars), and an interpretive exhibit. Precise location would be determined by more detailed planning.

Impact: The most important point is that this alternative would place an additional 9,000 acres of land containing predominately endemic plants and animals under permanent protection, thereby expanding the park's research and interpretive capabilities. It would also remove this same acreage from use for commercial timber production. The State of Hawaii is currently harvesting koa and ohia (both native trees) in this area.

Impact from development would result in disturbance of a maximum of one acre for formal development which would significantly alter the existing plant cover by removal of top soil and paving for parking, walks, and interpretive exhibits. A short trail would disturb additional land to the extent that it would become a corridor about 5 feet wide--a corridor that would encourage the growth of exotic plant species. The total area thus directly affected would be between 1/2 and 1 acre.



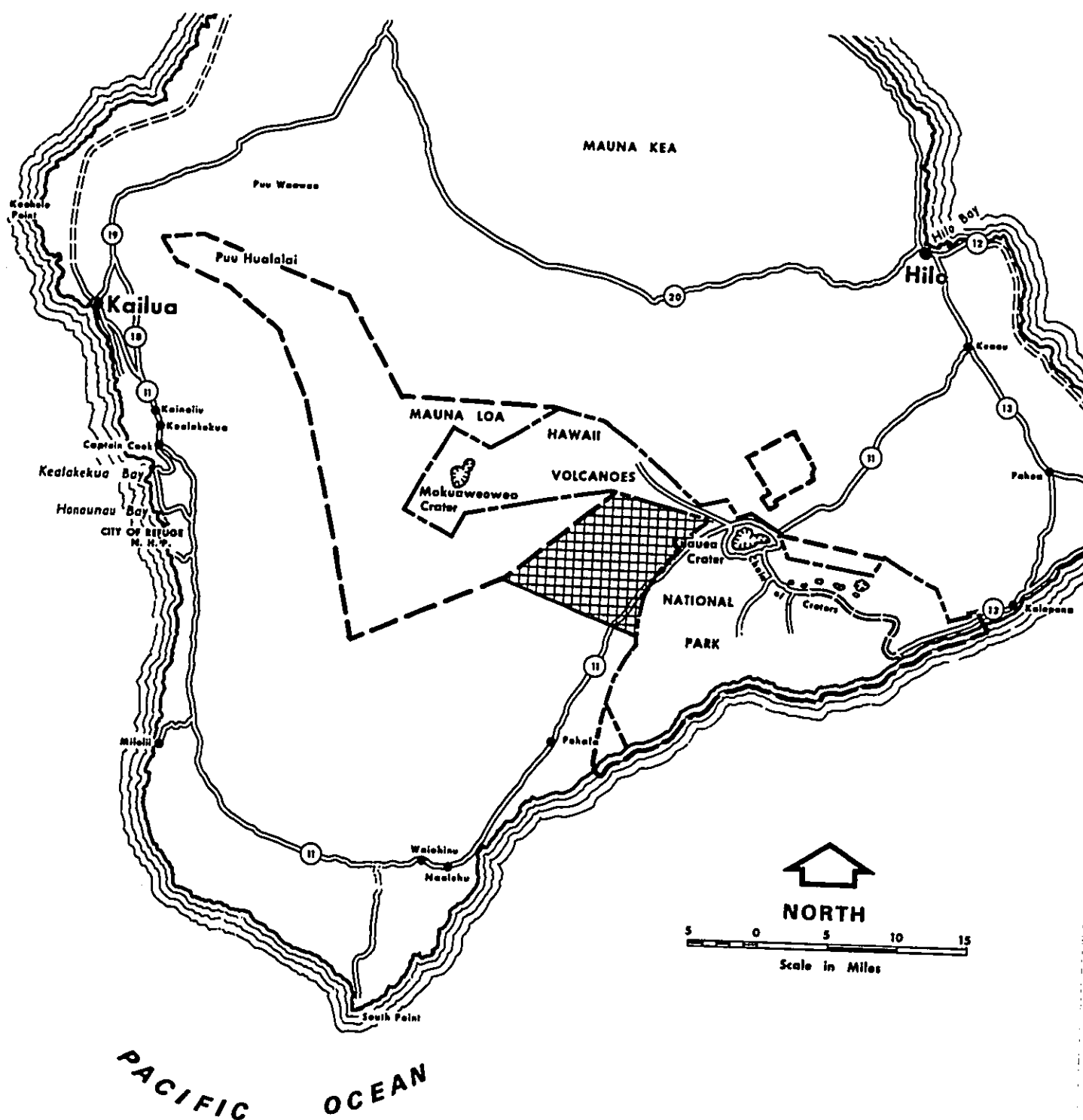
ALTERNATIVE E HAWAII VOLCANOES NATIONAL PARK

ALTERNATIVE F - ADD KAPAPALA RANCH AND KAPAPALA FOREST RESERVE
LAND TO THE PARK

Boundaries and Resources: This is a large parcel of land (about 50,000 acres), lying between Kilauea's southwest rift zone and the upper slopes of Mauna Loa, and much of it is within the view of persons standing on the rim of Kilauea Caldera. Much of the land is currently used for grazing so that little of the original native vegetation remains except scattered ohia. There are no known archeological or historical resources of note and since nearly all early Hawaiian habitation was in coastal areas, it is unlikely that any exist.

Management and Use: Predominant use of this parcel would be as open space as its elevation (3,500 to 7,000 feet) makes it unsuitable for camping or other overnight facilities, but hiking and riding would be appropriate uses.

Impact: The predominante effect would be to preserve in open space a large area that is a major part of the view of the Kilauea area. State zoning exercises control over land use and for the near future, it appears that this area will remain in the agricultural zone. Federal acquisition would, however, give the land greater protection as use controls would be more stringent under national park status. Such status would also remove the land from its current productive grazing use. Moreover, even if some structures were permitted on the land, the scale is so great that it would take a large development to create any serious visual impact. Location, climate, and limitation on water supply all argue against such a development.



ALTERNATIVE F **HAWAII VOLCANOES NATIONAL PARK**

LEGEND

- EXISTING PARK LAND
- CURRENT PROPOSAL
- ALTERNATIVE ADDITION

ALTERNATIVE G - REMOVE CONTROL MEASURES FOR FERAL GOATS AND PIGS

This is a current resources management program whose goal is removal of exotic species of animals to protect endangered native populations. Two impacts are most significant. Considerable funds would be saved that are now spent on a program whose outcome is still somewhat in doubt and whose techniques are sometimes the subject of criticism by local citizens. The average cost of this program in the last ten years has been \$40,000, and it is expected to increase in the future. Moreover, removal of fences would create a greater sense of wilderness in the park's backcountry.

Cessation of control measures would also mean almost certain destruction of endemic plants and animals that have shown signs of recovery as a direct result of the feral animal control program. Such action would assure the extinction of at least 3 dozen species of rare endemic plants and 9 endangered birds as well as the shift or loss of several entire endemic ecosystems.

ALTERNATIVE H - NO RECONSTRUCTION OF CHAIN OF CRATERS ROAD

This alternative involves the 10 miles of road recently covered by lava flows from the vicinity of Mauna Ulu. By not reconstructing the road connection, a greater section of the park would be preserved in an undeveloped state as wilderness or near wilderness. The area retained as roadless would be about 1,500 acres and would create one uninterrupted backcountry unit from the Chain of Craters to and including the park's entire coast.

The dominant visitor use pattern--Hilo through Kilauea and Kona, or reverse--would not be affected, thus the total capacity of the park to accommodate visitors would not be reduced appreciably. The exception to this is the Golden Triangle Tour that provides a circle trip from Hilo to Kilauea, Kalapana and return to Hilo during a single day. This tour would become impractical because of the backtrack travel required were the Chain of Craters Road not reconstructed. Before lava flows closed the road, this tour averaged about 12,000 per month and was increasing in popularity. Road access to all proposed and existing park facilities except a short section of the Chain of Craters would still remain under this alternative.

ALTERNATIVE I - EXPAND OVERNIGHT FACILITIES

This could involve Volcano House Lodge, Namakanipaio cabins, and campgrounds. It would increase the capacity of the park to accommodate overnight visitors in this cool, high-altitude environment, a complete contrast to the coastal climate where all other resort development is located. Thus, there would be increased opportunity for a variety of recreation experiences for park visitors. The same impact would apply for expansion of campgrounds and the Namakanipaio cabins, except that here the expanded opportunity for overnight use would extend to visitors with lower incomes.

Impact on the resources of the park is varied. Construction of facilities would likely disturb not more than a total of 20 to 25 acres for roads, parking, utilities, and structures. Most of this area would not be returnable to native cover. Assuming that lodge expansion were to be in the immediate vicinity of the Volcano House, the dominant impact would be visual. Any expansion would increase the visual impact on this most important feature in the park and in an area of already concentrated use.

ALTERNATIVE J - REMOVE U.S.G.S. FACILITY FROM KILAUEA'S RIM

Accomplishment of this alternative would remove a structure and its associated parking lot (about 2 to 3 acres) that has considerable visual impact, particularly as seen on the skyline from the Volcano House and the adjacent Caldera rim. It would also remove the function from the most effective location from which the survey can conduct research. It is an ideal vantage point to observe volcanic activity in Halemaumau, nearly all of Kilauea Caldera and both rift zones. Further, the visitor would no longer be afforded the opportunity to view the many facets of the volcanic research operation in this location.

ALTERNATIVE K - REMOVE KILAUEA MILITARY CAMP FROM THE PARK

This recreation resort complex, near the rim of Kilauea, occupies about 50 acres and is for the exclusive use of the armed forces, active and retired, and their families. Removal of the facility would provide additional open space in the most concentrated use area in the park. Further, it would remove an operation which is, in accordance with park policy, a non-conforming use since it is not open to the general public.

This alternative would also, in effect, prohibit members of the armed forces from experiencing the relaxed atmosphere and unique recreation experience now available to them at a nominal cost. Such a facility is not available elsewhere on the island, although alternative sites could be found, and Fort De Russy does offer a similar recreation opportunity in a concentrated urban environment.

ALTERNATIVE L - PROVIDE FOR HAWAIIAN HOMESITES BY DESIGNATING A
SPECIFIC PARCEL OF LAND FOR THIS USE

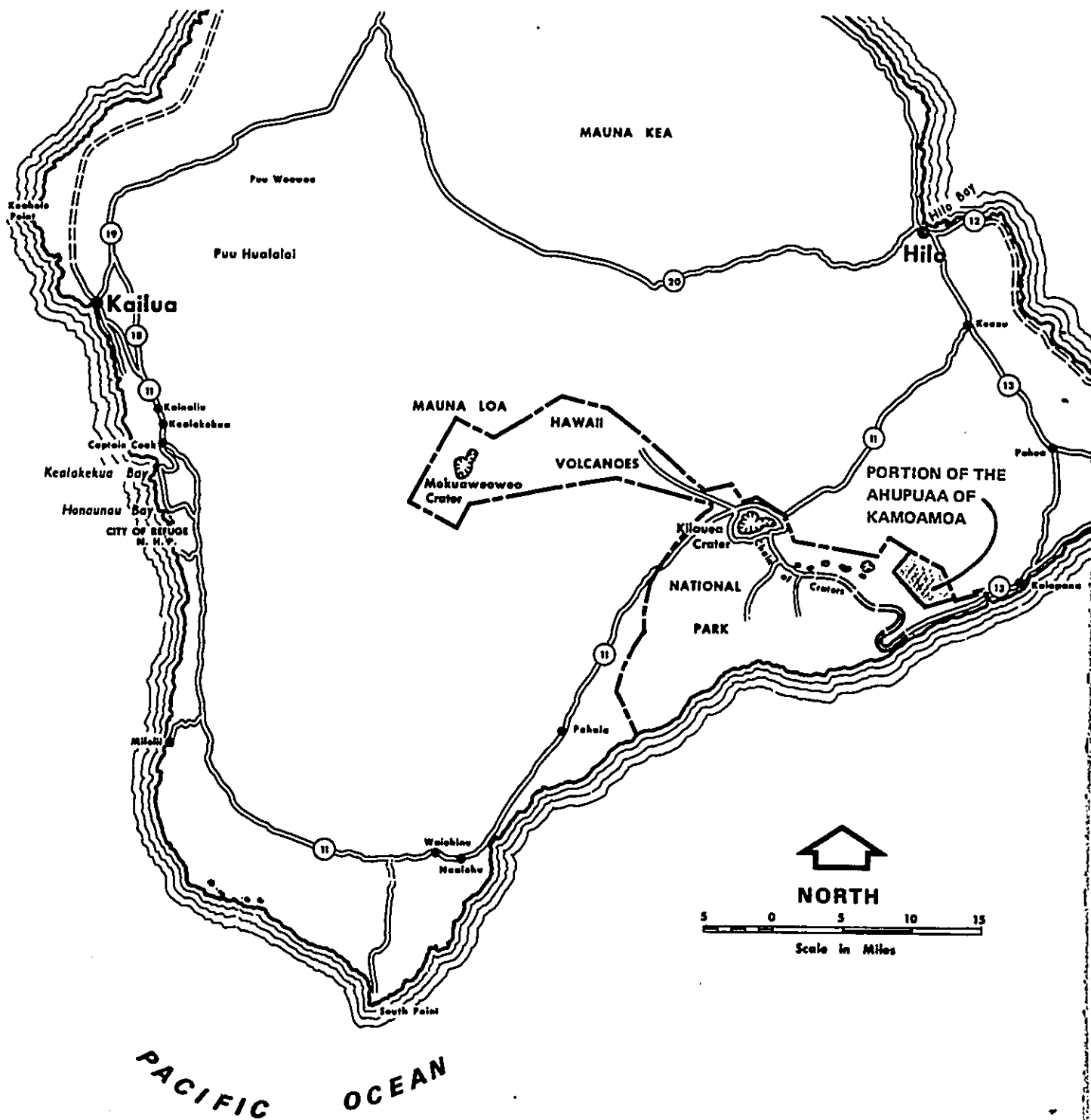
There are two possible methods of accomplishing the stated objective of this alternative and each has its own impact.

To meet the implied obligations to Hawaiians for homesites, as stated in the 1938 legislation adding the Kalapana Extension to the park, a parcel of land, probably within the ahupuaa of Kamoamoa, could be excluded from the park and given to the Hawaiian Homes Commission. This is a State agency with the responsibility of managing lands so designated throughout the state for use by native Hawaiian people. This would require Congressional action.

This would provide Hawaiians an opportunity for private use of land directly adjacent to a developing area and one with comparatively easy access, and distribution of these lands would be managed by an agency with the appropriate capability. It would result in a potential saving to the park's management program, the specific sum involved being indefinite because of the unknown number of applicants who might be involved.

Impact on the land involved would be considerable since roads, walks, buildings, and utilities might be constructed throughout the area. Moreover, much of the land could be altered to make it suitable for agriculture. As is the case with much of the park, this parcel contains numerous endemic Hawaiian plants. Some of these, such as ohe makai, hoawa, and ahakea are very rare but locally abundant in this particular location and development would endanger their existence, if not destroy them completely. Hawaiian honeycreepers are found at lower elevations in this area in great abundance also, and additional development would further endanger their existence.

The second method would be to retain this same land area within the park, but, in accordance with the same legislation, zone it for home-site use. Applications and any regulations on land use would be administered by the National Park Service. Management costs for such an operation would be considerable, probably in excess of 50,000 to 100,000 per year depending on the degree that utilities, roads, fire protection, and law enforcement activities are required. Cultural impact would be similar to that connected with the first method. Impact on the physical environment would also be similar except that in this circumstance there would be greater opportunity for the National Park Service to control use and development so as to minimize the effects on endemic plant populations and bird populations.



ALTERNATIVE L **HAWAII VOLCANOES NATIONAL PARK**

ALTERNATIVE M - ADD VARIOUS PARCELS OF LAND CONTAINING UNIQUE
BIOLOGICAL VALUES

This could be one or more of a number of land parcels of various sizes that contain Kau Silversword, nene nesting areas, petrel nesting areas and other native birds or plant communities. Some of these are immediately adjacent to the park boundary while others would be detached areas.

Addition of such lands would expand considerably the scope of resources protected by the park and would give additional species of plants and animals some greater chance of survival. It would also increase the cost of park management and expand it into areas where the appropriateness of Federal involvement is dubious. Moreover, it would remove these resources from possible preservation action by the State of Hawaii at a time when interest in preservation of native species is greatly increasing.

CONSULTATION AND COORDINATION

Consultation and Coordination in Development of the Proposal and in the Preparation of the Draft Environmental Statement

The master plan proposals for Hawaii Volcanoes have been under consideration and preparation for about 5 years. During that period, Federal agencies, State governmental bodies, local agencies, and individuals were contacted and gave advice on the proposals as they were developed. The following is a list indicative of the sources contacted and their general contribution to the planning effort.

Department of the Interior

Bureau of Outdoor Recreation - general review of proposals, particularly those involving boundary changes.

U.S. Geological Survey - volcanic research, its impact on resources, on public use, and on park management.

Department of Defense

U.S. Army - Kilauea Military Camp and its place in the park's future use patterns.

State of Hawaii

Office of the Governor and Lieutenant Governor - general review of entire proposals and impact on State programs.

Department of Land and Natural Resources - general review and discussion of specific State programs as they apply to or are affected by Federal programs. (Examples - management of wildlife, construction of use facilities and administration.)

County of Hawaii - Effect of proposals on county plans for park and recreation, access patterns and land use.

University of Hawaii - Student participation in obtaining detailed data on possible impact resulting from master plan proposals.

Bishop Museum - Use of previous studies on archeological resources.

COORDINATION IN THE REVIEW OF THE DRAFT ENVIRONMENTAL STATEMENT

Copies of the draft environmental impact statement and a request for comments will be sent to the following Federal and State agencies and private organizations:

- Advisory Council on Historic Preservation
- Department of Agriculture
 - Soil Conservation Service
- Department of Defense
 - U.S. Army
- Department of the Interior
 - Bureau of Indian Affairs
 - Bureau of Mines
 - Bureau of Land Management
 - Bureau of Outdoor Recreation
 - Bureau of Reclamation
 - Bureau of Sport Fisheries and Wildlife
 - Geological Survey
- Department of Transportation
- Environmental Protection Agency
- State of Hawaii Clearinghouse
 - State Historic Preservation Officer
- Metropolitan Clearinghouse
- Audubon Society
- Bishop Museum
- Congress of the Hawaiian People
- Life of the Land
- Sierra Club
- Society of American Foresters
- The Hawaiians
- The Nature Conservancy
- University of Hawaii
- Wilderness Society